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CONTEST FOR POLLOK PRIZE OPENS THIS WEEK.

Recent maritime disasters, with their attendant appalling loss of life, have created renewed interest in the subject of life saving at sea. In this connection the competition to be opened at Havre, France, during the present week, for the best means of saving shipwrecked passengers and crews, is being closely watched by the life saving services of every country. In order to stimulate inventors a reward of \$20,000 goes to the successful exhibitor. The donors of the prizes are the heirs of the late Anthony Pollok of Washington, D. C., who was among those lost in the wreck of the steamship La Bourgogne, off the coast of Sable island, in July, 1898. The prize is given to honor and perpetuate the memory of their relative and in the hope that some inventor will come forward with a practical appliance to avoid the repetition of such terrible disasters. The prize is intended to recompense the best device fulfilling at least one of the three following conditions: To prevent collisions at sea; to save the ship in case of collision; in case the ship is abandoned to save passengers and crew collectively.

Experience has caused the managers of the competition to reject devices and apparatus which cannot be relied upon in case of accident. It has, therefore, been decided to exclude: First, apparatus and devices designed to save individuals separately, such as life-belts, waistcoats, buoys, etc.; second, all such apparatus and devices as so encumber the deck as to seriously interfere with the carrying capacity, both as to passengers and freight, or such as could not be readily adapted and used on ships as now in general service, and thus necessitating the construction of new ships, which would render the adoption difficult and improbable; third, all such inventions as are simply improvements or modifications of appliances or apparatus already recognized as insufficient for the purpose of saving the passengers and crew collectively, such as lifeboat davits, oil-throwing devices, etc.; fourth, rafts of all kinds which must be mounted, assembled or inflated at time of accident, and hatch covers, deckhouses, etc., which are supposed to float automatically when the ship sinks.

During the international exhibition at Paris last year, the heirs of the late Mr. Pollok offered in connection with the exposition a prize similar in amount to the present one, but the result was not satisfactory. The competition was highly important, however, as indicating the general lines upon which the competition again to be opened is to be conducted. The jury passing upon the various exhibits at Paris was composed of the ablest nautical experts of France and other countries, and the report it submitted has proved of great value to those charged with framing regulations for the present competition. This jury found that of the 435 exhibits before it, none was of sufficient value to merit the prize in its entirety, though one exhibitor was thought worthy of a portion of the prize.

The exhibits formed a heterogeneous collection, comprising about all the various life-saving appliances it would be possible for human ingenuity to devise. While many of these were considered very clever and original by the jury, and worked out with great mechanical skill, it was plainly apparent to a board of sailors that the great mass of exhibitors were unacquainted with the conditions under which their appliances would have to be used. The competitors, excluding professional cranks, were largely mechanical inventors, having little or no real conception of the actual conditions at sea. They presented models and designs for getting overboard boats, rafts, etc., which would doubtless work very well in the hands of a sufficient number of tried and trained men charged with the care and operation of such appliances, but the bare thought of being responsible during heavy weather at sea for the successful operation of such machines for saving panic-stricken passengers under present conditions, would make a seaman's hair stand on end. Others understood the desired object to be a steamer built with so many water-tight compartments that no conceivable accident could put it in danger of sinking, with a total disregard of the fact that a vessel of this nature could be designed only at such an expense of extra weight, loss of carrying capacity and speed as would place the improvement beyond the scope of practical realization.

A considerable number of inventors were misled by the time-honored idea of placing rafts, floats, detachable decks and even smaller vessels on or in the steamer, with the cheerful assumption that she would peacefully sink on an even keel and allow these appliances to float off with passengers, food, water and sails all ready for use. A few minutes' reflection and a superficial knowledge of the laws of gravity would have convinced them that only in the infinitely improbable case of a vessel making the same amount of water fore and aft and on the starboard and port sides, and of the equally improbable chance of the density of loading being the same throughout the cargo, could she possibly settle and disappear on an even keel. Lifeboats were also presented in great variety, but the lifeboat in general use is generally satisfactory, and an improved boat is of little additional advantage on board ship unless means are supplied for getting it overboard in a very short space of time—for this is the great necessity in the minds of officers charged with the responsibility for human lives. Many ingenious life-belts, buoys, jackets and garments came before the board. Some of them were curiously complicated, and supplied with food, stimulants, fog horns, signal flags, sails, umbrellas and what not. A majority of these depended upon inflation for their buoyance. The preponderancy of the inflation principle was doubtless due to the idea that the best appliance is the one supporting the most weight, whereas, in fact, a great excess in buoyancy is very apt to be an additional danger except in the hands of an expert.

The jury, after examining the various appliances brought before it, decided that only one exhibitor had grasped the correct idea of collective life-saving. This exhibitor, Leopold Roper of London, was, therefore, awarded a prize of \$2000. In the opinion of the jury, Roper's invention was much superior to any other presented, though itself dating back many years. It was a large flat-bottomed boat or raft, built of thin steel,

with a deep double bottom, containing numerous compartments. The bottom plates are arched up between the longitudinal frames or keels for additional strength to stand the shock of the impact with the water when launched. It rests on two heavy cross-beams, supported by strong up-rights at their outboard ends, and slides on heavy rollers or trucks. By means of a very simple mechanism, put in motion by a single crank lever, the beams can be lowered to starboard or port as desired, and by the releasing of a powerful friction clamp the boat slides easily over the side, being maintained at its original angle until near the surface of the water by two heavy guides, which form an extension to the beams and are automatically lowered with them. The entire mechanism is simple and easily kept in order. On board ship this raft, which weighs but six tons and is capable of sustaining 600 persons with fresh water and provisions for several days, serves as the captain's bridge, and consequently neither adds materially to the weight nor encumbers the deck. The cost of the raft is about \$2000, or little more than an ordinary bridge, and much less than a boat of the same carrying capacity. In the eyes of the jury the strongest point in favor of Roper's invention was the fact that it had been favorably tested. Two of these bridges are now fitted on H. M. S. Polyphemus, and it has been demonstrated that actual launching can be accomplished in 45 seconds, with 200 men on board.

The donors of the prize are anxious that some invention will be submitted which will obtain the entire approval of the jury, and be found worthy of adoption by the maritime nations of the globe. At present the device submitted by Mr. Roper seems most likely, when improved in several minor particulars, to solve the problem. During the present year, however, the inventive mind has been given quite a stimulus by the offer of \$20,000, and from all quarters of the globe designs and models are being sent to the French seaport. The progress of the competition will be watched with much interest in naval circles abroad, and will be made the basis of a report by representatives of foreign governments now at Havre.

LAKE FREIGHT SITUATION.

Vessel owners of the great lakes are still expecting some improvement in freights during October and November, the closing months of the season; this in addition to the fact that freights prevailing from the opening of navigation up to this time—80-cent ore basis from the head of Lake Superior—insure a fair profit for all kinds of vessel property for the full year. There is, of course, some question as to whether the vessel interests are right in looking for high fall freights. Their expectations are based upon a heavy grain movement, especially from the head of Lake Superior, and an urgent demand, even into December, for coal carriers to make up the shortage that exists in coal supplies both on Lake Superior and Lake Michigan. Added to these demands it will be necessary to have also a fairly large movement of iron ore for the balance of the season. On this latter score the ore shippers are not agreeing with those who talk of a strong closing freight market. They refer to statements showing that ore shipments are now up to last year and they claim that in addition to having the season's movement already well in hand, they will derive considerable advantage from this time on through relief from delays at Lake Erie docks, which has been noticeable to some extent during the past ten days. The position of the Steel Corporation as regards its ore movement can not, of course, be learned, but it is claimed by other ore shippers that the big organization will have a surplus of vessel capacity for the closing portion of the season. For the present, however, there is immediate demand for all vessels offered at prevailing rates in all branches of the ore and coal trades. A very large amount of vessel capacity has been chartered to take grain from Duluth to Buffalo when the crop begins to move actively, and developments of the next week or ten days will probably determine what may be expected in freights on account of grain shipments.

A feature of the week's developments in iron and steel circles is the activity in steel rails. The steel rail demand gives promise of prosperous conditions next year in all branches of the iron and steel industry. This is a matter of some encouragement in lake vessel circles, as new vessels capable of carrying 2,500,000 tons in a season will come from the stocks next spring, and the old question "What will be done with this surplus?" has repeatedly been asked of late. The price of steel rails for 1902 has practically been fixed at \$28. The railroads are covering their requirements earlier this year than ever before, and within the next thirty days it is probable that the bulk of the steel rail business for the next year will be placed. It is stated by railroad officials that, owing to the large amount of new construction mapped out for next year, together with the relaying of many of the southern and western roads with heavier rail sections, the tonnage required next year will exceed the output of the rail mills this year.

It is reported on reliable authority, says London Fairplay, that Sir Christopher Furness has made a deal with Director Ballin of the Hamburg-American Steam Packet Co. and that as a result three steamships are to be built and engined by Palmer's Ship Building Co., Jarrow-on-Tyne, and three by Furness, Wiltney & Co., Hartlepool, with engines by Richardson, Westgarth & Co. The vessels are to be of unusually large size and to have some cabin accommodations.

Preliminary dock trials of the torpedo boat Decatur have been inaugurated at the works of the contractors, the Wm. R. Trigg Co., Richmond, Va. The balancing of the machinery is found to be nearly perfect and the workmanship shows to good advantage under steam. The Decatur and Dale will be taken to Baltimore within the next few weeks for the changes ordered in their sterns and immediately thereafter the official trials will be carried out.

SHIP BUILDING IN PHILADELPHIA AND VICINITY.

Philadelphia, Sept. 11.—The exploded boiler of the steamer City of Trenton has been lying on a pier at Neafie & Levy's ship yard for several days and has been closely examined by the government inspectors who are making rigid inquiry into the cause of the disaster. The boiler was found to be well built and in good condition with no structural weakness apparent. The crown sheet had been blown downward, carrying with it a portion of the back tube sheet. The collapse pulled it away from the radial stays. The latter were found intact. While the examination of the witnesses will not take place for several days the inspectors admit that it will be but a formality to fix the responsibility. There is a consensus of opinion among marine engineers here that the damaged boiler tells its own story of low water and a burned crown sheet.

The new torpedo boat destroyer Bainbridge has been given a trial spin on the Delaware, which demonstrated to the satisfaction of her builders that she will fulfill every requirement of the stringent official trial which is to follow in a few days. President Matthias Seddinger of the Neafie and Levy company is very much gratified that the Bainbridge was able to go out on her builder's trial trip in exactly one week after she was launched. No attempt was made to speed the vessel. The run was to Marcus Hook, about twenty-five miles below here, and return, and was attended with perfect success. The engines ran very smoothly and with a minimum of friction. The vessel's contract calls for a speed of 29 knots, but owing to the changes made in her stern lines it is thought that she will do better than that. The Chauncey, the second of the destroyers building by the Neafie & Levy, will be launched next week. Her sponsor will be Miss Mae Chauncey Stevens of Grand Rapids, Mich.

The shipping commissioners, O'Brien, Smith and Henley of this port, have engaged the men for the Russian battleship Retvizan, including firemen, coal passers and oilers. Men especially skilled in those vocations were taken from the Cramp ship yard and the new men will assist them. Nearly 300 men were required for the vessel. Edwin S. Cramp, superintending engineer of the Cramp company, is in general charge of the trial trip, and, although the latter is merely to test the structural strength of the ship under gun fire, her builders will satisfy themselves that she is in condition to make her contract speed of 18 knots an hour. Since Major-General Brynk, of the Russian navy, has been on duty at the ship yard he has made several changes in the program originally mapped out for the first trial trip. It was originally intended that only the 12-in. turret guns should be fired, but the General has informed the Cramps that he intends discharging them all with the end in view of thoroughly testing the strength of the battleship. The Retvizan may be away from the city for several days, but will not leave the vicinity of the capes of the Delaware.

The Cramps have an extensive repair job on hand in connection with the steamship Niagara of the New York and Cuba Mail Steamship Co.'s fleet. The vessel arrived in Philadelphia on Tuesday and will be supplied with a new set of boilers. The steamship Vigilancia of the same line, now in the drydock at New York undergoing an overhauling, will also come here for her boilers. The American liner New York is expected back from the Erie Basin, where she has been having her bottom scraped and painted, tomorrow. She will be rapidly rushed to completion with a view to have her ready to return to the line by the middle of October.

The contract to build new block, cooper and spar shops for construction and repair at League Island navy yard has been awarded to Henderson & Co., Ltd., of 1213 Filbert street, this city, for \$107,206. This is \$6,000 within the amount authorized by congress for the structure. The first appropriation, made a year ago last winter, was \$60,000, and the limit of cost for the building at that time was fixed at \$113,400. The last naval bill added to the amount already available \$53,400. The specifications call for a substantial two-story brick and steel building, about 35 ft. wide and 350 ft. long. The strongest form of concrete foundations are called for to be laid on timber piling, which must be driven down at least 30 ft. The contractor is required to begin work at once and to proceed as rapidly as is consistent with good construction. The base course of the entire building, as well as the base of all piers, will be of granite. The contract covers interior fitting, heating, ventilating, pumping and similar necessary appurtenances. The frame building now on the site is to be taken down and removed by the contractor. This handsome building will add another to the array of shops and other structures which are fast transforming the local navy yard into the best appointed station of the kind belonging to the government.

THE CZAR'S OFFICIAL CRAFT.

Word has been received by Cramps, Philadelphia, that the new cruiser Variag has been selected by the czar of Russia as the craft to be used on all his private trips. The news of the selection of the Variag was particularly gratifying to the Cramps, as well as to the Russian officers who are in Philadelphia waiting to take the big battleship Retvizan home. The czar inspected the ship when she arrived at Cronstadt, several months ago, and pronounced himself greatly pleased with her. Since then he has been aboard her several times and has learned of her speed and seaworthiness.

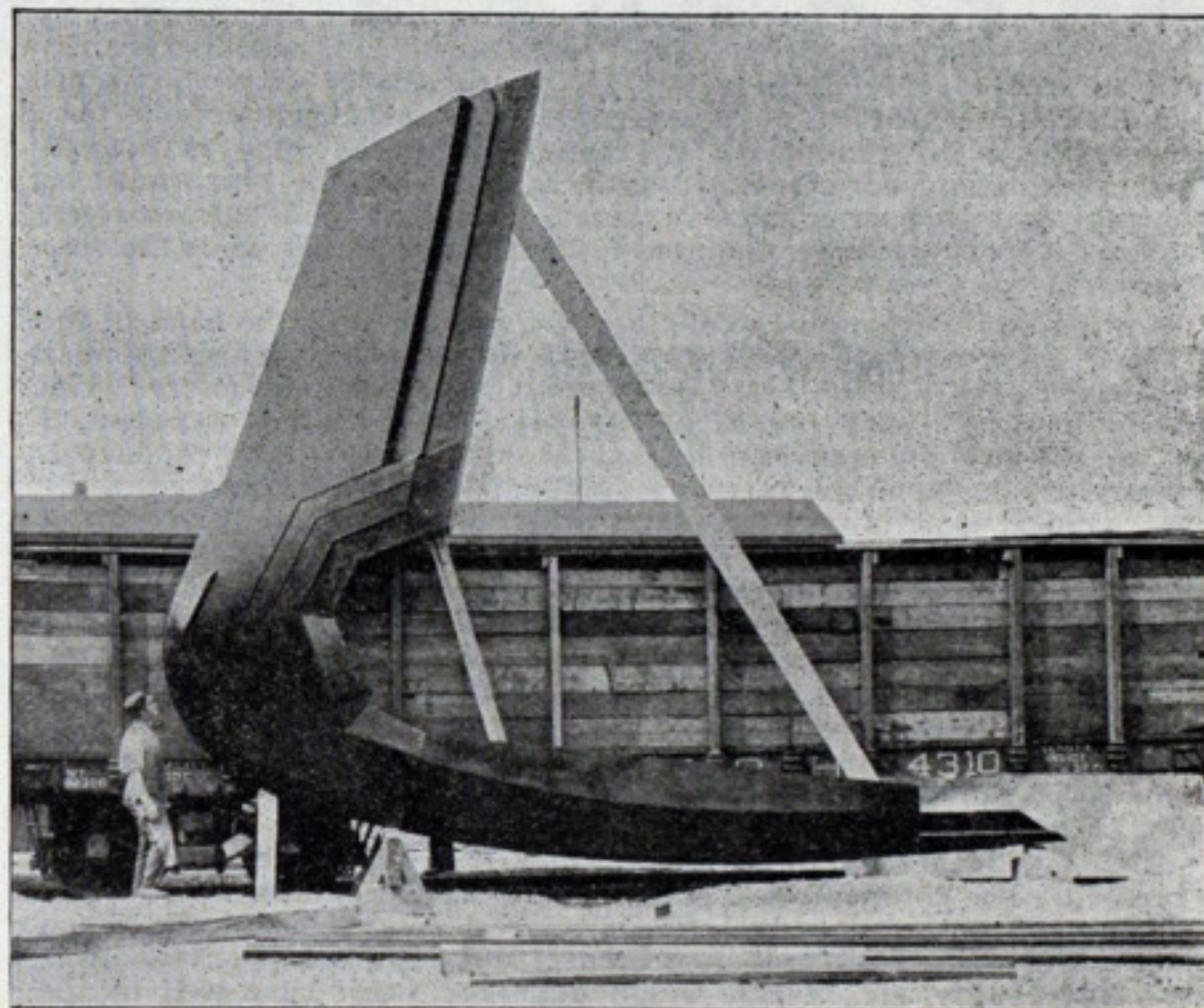
The cruiser is about to start for Vladivostock, the Russian port in Siberia, and will carry out the new consular code to the Russian representatives all along the route. It will be a leisurely journey and all stories that it is intended to make a voyage as a test of the vessel's ability to do it without recoaling are pronounced absurd. As the czar's official craft, the Variag will be the most noted vessel in the Russian service and Capt. Vladimir Behr and his men will occupy envied places. The Variag was launched at Cramps' ship yard on Oct. 31, 1899, and is the fastest cruiser ever built. She maintained a speed of more than 23 knots through twelve consecutive hours on her final trial, running all the time under natural draft. She is 400 ft. long, 52 ft. beam, and her displacement is 6,500 tons.

Spencer Miller, engineer, the Lidgerwood Mfg. Co., sailed for Europe Aug. 31 on the Patricia of the Hamburg-American line. Mr. Miller will attend the trials by the British admiralty of his most recent invention, the marine cableway. The task set by the admiralty is forty tons of coal per hour to be transferred from ship to ship, speeding at 10 knots.

WARSHIPS FOR THE MEXICAN GOVERNMENT.

Lewis Nixon of Elizabethport, N. J., has secured a contract from the Mexican government for two warships. He was not the lowest bidder but his designs pleased the Mexican government. The new vessels are about the size of the Machias class of the United States navy. They are each 200 ft. long, 33 ft. beam and displace 1,000 tons on a draught of 10 ft. They are of steel throughout, with quarters arranged for comfort in tropical waters. The vessels will carry coal enough to steam 7,000 miles. Their battery consists each of four 4-in. rifles, four 6-pounders and a bow torpedo gun for firing automatic torpedoes. The speed is to be 16 knots an hour. With the completion of these vessels the Republic of Mexico will possess two up-to-date cruisers that will compare more than favorably with similar vessels of other nations. The vessels are so fitted that 200 soldiers, in addition to the regular crew, can be berthed on board and they can therefore be used as transports for transferring troops hurriedly from one part of Mexico to another.

President Diaz and Gen. Reyes, the minister of war and marine of the republic, have taken great interest in these vessels and have expressed their satisfaction that they are to be built in the United States. The award of the contract is significant from the fact that Europe has hitherto built practically all the vessels for Central and South America, with the result that many millions of dollars have been spent in European ship yards. The Mexican government has sent a strong and capable commission to superintend the building of the ships. It is headed by Col. Flaviano Paliza, one of Mexico's greatest engineers. He has with him his construction engineer and a large force of officers and cadets, who will see every part of the vessel assembled, and will be ordered to duty on them when completed. The engines of the warships are triple expansion of about 2,400 H.P. The boilers are of the tubular type. Work on the vessels has already been begun. Keel blocks are laid and the plates are under way.



The accompanying illustration is that of a pattern for the steel casting for lower part of stems of the 15,000-ton battleships New Jersey and Rhode Island, for which the Fore River Ship & Engine Co., Quincy, Mass., has the contract. This casting will weigh about 72,000 lbs. and measures about 26 ft. across corners. Approximately 3,000 ft. of lumber entered into the construction of the pattern.

RAILWAY REQUIREMENTS IN STEEL.

Bradstreets directs attention to a feature of railway development that is bringing about a new and special demand for steel. While the activity in construction during the present year is comparatively large, and promises to add a normal amount to the aggregate railway mileage of the country, it may be noted that a very large addition is being made to the existing railroad systems in another way. Up to within a few years double-track railroad hardly existed beyond the western termini of the trunk-line systems. It is true that some of the western portions of the trunk-line systems, notably the Lake Shore and the Pittsburgh, Fort Wayne & Chicago roads, had been in part or whole double tracked, and a few of the lines leading out of Chicago and other large cities were also provided with double tracks for the accommodation of their suburban traffic. At present, however, a number of the large western railway systems are engaged in double tracking their entire roads, the Chicago, Burlington & Quincy in particular having completed its addition to its main line to a point beyond the Mississippi river, and the same is true of the Chicago, Rock Island & Pacific and the Chicago, Milwaukee & St. Paul. The Chicago & Northwestern also is rapidly completing the same work, so that within a year or so at most double-track lines will extend from New York and other Atlantic ports as far west as St. Paul, St. Louis and Omaha. The work of double tracking in the great western systems is accompanied by a general reduction of grades and an elimination of curves, so that the improvement in question is of much more importance than the mere substitution of two tracks for one. While coming under the head of betterment the operations in question, conducted as they are simultaneously by some of the largest railroads in the country, involve a heavy expenditure and a considerable addition to capital accounts, while they furnish a market for steel rails and other railroad material on a scale fully as large as if positive additions were being made to the railroad mileage of the country.

BOILER TRIALS OF HYACINTH AND MINERVA.

THE OFFICIAL REPORT GOES INTO GREAT DETAIL BUT DOES NOT ALTER THE GENERAL FINDINGS ALREADY REPORTED—THE TRIAL DEMONSTRATED LITTLE.

So much has been said in these columns regarding the boiler trials of the British vessels of war Hyacinth and Minerva, the former fitted with Belleville water tube and the latter with cylindrical boilers, that it seems superfluous to say anything further. However, all that has been said so far is unofficial. It would, therefore, seem strange if the official report should be ignored. This report has just been received. Mr. W. H. May, the controller of the navy, in forwarding the report to the first lord of the admiralty, says:

"I wish to draw your attention to the following points in this trial: First, the very serious loss in Hyacinth as pointed out by the president of the boiler committee. This was due to leaky joints. A certain number were located at Gibraltar and on examination at Portsmouth other leaks were discovered and reported. Second, the state of the Minerva's tubes at the end of each run. On arrival at Gibraltar the cap ferrules were found to be partially choked, due to 'bird nesting' and the ship could not have gone any further at that power (7,000 I.H.P.) As it was, she was using up to 1.7 in. of air pressure instead of $\frac{1}{2}$ in. to maintain the necessary combustion for this power. On arrival at Portsmouth practically the same thing occurred, as will be seen from the reports. Third, the Hyacinth developed an average of 1,000 I.H.P. more than the Minerva on the run home; this should have given the former a substantial increase in speed, whereas there was a slight decrease. The extra indicated horse power must have been absorbed either in the engines or in the main shaft bearings or in the hull. It is possible that the shape of hull may have had something to say in the matter, but the former trials do not bear this out. For example, when the Highflyer (same class) was tried against the Minerva last year the former maintained a higher power and speed, except at 10 knots, when she had to exert more indicated horse power to obtain the speed. The case requires investigation."

The statement of Vice Admiral Compton Domville, president of the boiler committee, is as follows:

Representatives of the boiler committee, consisting of the president, three members, and the joint secretaries, embarked in Hyacinth and Minerva at Devonport, about 2 p. m. on July 6. The ships sailed at about 3 p. m. on that day, and started working up to 7,000 H.P. It was intended that the ships should maintain 7,000 H.P. till all the coal, except that in the reserve bunkers (82 tons), was exhausted. By 3:45 p. m. the revolutions in the Hyacinth were 152 per minute and the horse power 6,994, and the trial was considered to have started from that time. The Minerva's trial commenced at 4 p. m. The Minerva soon showed that she was the faster ship, and steadily drew away from the Hyacinth. By midnight on the 7th the Minerva was about $4\frac{1}{2}$ miles ahead. When passing through the Straits of Gibraltar, early in the morning of the 9th inst., a fog was encountered; the Minerva eased down for 55 minutes, while the Hyacinth had to ease down for two hours. On running out of the fog both ships again worked at 7,000 H.P. At 4:30 p. m. on July 10, a bolt of the ahead eccentric strap of the starboard intermediate engine of the Minerva broke, and the starboard engines had to be stopped; the port engines continued running. The strap was found to be damaged and had to be replaced by the spare one. This work was carried out in about two hours, and at 6:40 the starboard engines started working again, and were worked up to the required power.

It had been arranged that the water in the reserve tanks of both ships should be used as the only make-up feed-water until it was reduced to twenty tons, in order that the amount of make-up feed used per day might be accurately determined. When the reserve had been reduced to twenty tons, this water was to be kept intact in the tanks ready for use in case of emergency, and all make-up required was to be obtained from the evaporators. Special reserve tanks had been fitted in the Hyacinth to hold about 100 tons; this, added to the original reserve tank stowage, gave a total reserve tank stowage of about 140 tons. The total reserve stowage of the Minerva was about 170 tons. When the amount was reduced to thirty-five tons in the Hyacinth, the staff engineer asked to be allowed to start the evaporators on account of the difficulty of getting the water out of the tanks by the special pump fitted for these trials. Two Weir's evaporators working with exhaust steam were started at 5:30 a. m. on the 9th, and the two Normandy's during the afternoon of the 10th. At 1:15 a. m. on the 11th of July, the staff engineer of the Hyacinth reported the engines would have to be eased on account of the large loss of water, and the trial was abandoned from 1 a. m. All the evaporators were working at this time, and in addition to the water from the reserve tanks, twenty-five tons of drinking water had been used for boiler make-up. The Hyacinth returned to Gibraltar at slow speed, arriving there on the evening of the 11th.

The Minerva continued steaming at 7,000 H.P. till 11 p. m. on the 12th, at which time there were still thirty-nine tons of coal in the bunkers, not including the reserve, and twenty tons of water remained in the reserve tanks. The average horse power of the Hyacinth was 7,047 for 103 $\frac{1}{4}$ hours, with a coal consumption of 1.97 lbs. and the distance run was about 1,810 miles, at an average speed of 17.6 knots; the Minerva's horse power was 7,007 for 147 hours, with a coal consumption of 2.06 lbs., and the distance run was about 2,640 miles, at an average speed of 17.96 knots.

On the night of the 10th of July, flaming occurred at the after funnel of the Hyacinth, but no flaming was reported from the Minerva. On examination of the Minerva's boilers after arrival at Gibraltar, it was found that the openings in the admiralty ferrules were seriously choked, the size of the openings, in some cases, being reduced to about one-third the original. The boilers and engines in both ships worked well on the way out, with the exception of the eccentric strap bolt of the Minerva, and a number of leaks which developed in connection with the boilers of the Hyacinth; these latter appeared to become worse after the engines were suddenly eased on entering the fog on the 9th, on which occasion the pressure of the boilers became sufficiently high as to lift the safety valves. The loss of water in the Hyacinth was at first attributed to leaky feed suction pipes, but during the stay at Gibraltar these pipes, the feed

and hot-well tanks, and the boilers and boiler blow-outs, were water-pressure tested, and no leaks beyond those already known to exist in the boilers were discovered.

As no serious leaks could be discovered during the stay at Gibraltar, the leaky joints in the Hyacinth's boilers were re-made by the ship's staff; and on Tuesday, the 16th, the ship was taken out for a run at about 7,000 H.P., to test the amount of feed-water being lost. This was found to be at the rate of 55 tons a day, from the records of a six hours' run; after being under way three hours, the engines were eased by order from the deck, and the boiler safety valves allowed to blow off freely so as to reproduce the circumstances that occurred in the fog on July 9. The rate of loss of water was calculated from a steady three hours' run before easing and a steady three hours' run after easing, a fresh start being made after easing down, and the water lost during the period the safety valves were allowed to blow being neglected. On return the Hyacinth anchored in the bay at 4:30 p. m. and all fires were drawn except those in two boilers. The Minerva steamed from the Mole with three boilers alight and anchored in the bay at about the same time as the Hyacinth anchored; fires were drawn from two boilers. Gibraltar dock yard made a spare eccentric strap for the Minerva and supplied it to the ship on the morning of the 17th. At 3:30 p. m. on the 17th the committee embarked; at the time the Hyacinth had two boilers alight for auxiliary purposes, and the Minerva one. The boilers of both ships had been thoroughly cleaned during the stay at Gibraltar. Before the ships began the homeward run a communication as follows was handed the captain of each ship:

"On the responsibility of the ship's officers, a large quantity of fresh water for boiler make-up has been taken as a precautionary measure in the double bottoms of the Hyacinth, and in the extra reserve tanks of both ships. These latter tanks were not fitted specially for the outward trials and do not form a part of the ship's ordinary fittings. It is to be understood that, except the amount originally allowed to each ship (about forty tons in the ordinary reserve tanks), this is to be used in cases of emergency only during the homeward run. The evaporators, if they have not been in use before, are to be started as soon as the forty tons mentioned have been used up, and then the make-up required is to be obtained from the evaporators. If the evaporators are unable to supply the whole of the make-up required their use at maximum obtainable output is to be maintained, while the remaining water used must be taken from the reserve tanks."

In the case of the Minerva the expenditure of the forty tons in question was not exceeded, but the Hyacinth had used the forty tons by 5:15 a. m. on the 20th, though all her evaporators had been working practically all the time. At the conclusion of the trial it was reported that ninety-eight tons of water had been used from the reserve tanks of the Hyacinth as make-up feed in addition to that made by the evaporators. The ships were informed that on the signal being made at an unknown time after 4 p. m. by the senior officer at Gibraltar fires were to be lighted in the boilers not at work and the ships were to proceed to Portsmouth as fast as possible. The signal was actually given at 4:27 p. m. The engines of both ships had been warmed through by steam from the boilers alight. At 4:30 p. m. the Hyacinth's engines were worked slowly in accordance with orders from the deck, steam being supplied by the two boilers which were alight. At 4:52 the after group of boilers were connected up. At 5:05 the forward group and at 5:09 the middle group were connected up, the steam pressure being 200 lbs. At 5:20 p. m. the Hyacinth was proceeding at 150 revolutions per minute, the horse power being nearly 7,000.

At 4:30 p. m. the Minerva's engines were worked slowly in accordance with orders from deck. The boilers were connected at the following times: 2nd, 4:55; 3rd, 5:02; 4th, 5:07; 5th and 6th, 5:10; 7th, 5:12; 8th, 5:15. The engines were working up to full power at 5:16 p. m., but had to be eased several times between 5:30 p. m. and 8 p. m., on account of eccentric straps warming up.

At 5:15 a. m. on the 18th the Hyacinth was about six miles ahead of the Minerva; but, both ships running into a fog, the Minerva ran up to the Hyacinth, and at 9:30 a. m. on the 18th, on emerging from the fog, the ships were nearly level, the Minerva being slightly ahead. Both ships then worked up to the maximum power, but throughout the day the Minerva was stated to have gained one-third of a knot an hour on the Hyacinth. At 7 p. m. another fog was encountered, and the ships went slow through the night, keeping close to each other. At 9 a. m. on the 19th they were again level. The fog having cleared, both ships went on again, and during the day the Minerva gradually drew ahead, and was stated to be going a quarter of a knot an hour faster than the Hyacinth. At 7 p. m. the Hyacinth again eased owing to fog, and went slow till 5 a. m. on the 20th, the Minerva being out of sight ahead.

The Hyacinth then steamed at over 9,000 H.P. till 6:10 p. m. on the 20th, when the fires of No. 10 boiler were drawn on account of a burst tube; one man was slightly injured by the steam and hot coal. At 9:50 p. m. the trial in the Hyacinth finished, the ship being then off St. Catherine's, and she arrived at Spithead at 11:30 p. m. The Minerva had passed St. Catherine's at 8:20 p. m., and anchored at Spithead at 9:45 p. m.

The coal used by the Hyacinth on the way home was stated to be 550 tons; by the Minerva, 451 tons. The Hyacinth's evaporators were all in use practically the whole time, but the Minerva used hers but little.

The maximum power developed by the Minerva was about 8,700 H.P., while that developed by the Hyacinth was nearly 10,000 for at least two hours, during which time the Hyacinth did not perceptibly gain on the Minerva. The Hyacinth's average power when running clear of fog was about 9,400, and the Minerva's about 8,400 H.P.

From the results of the outward run it appears that the radius of action of each of these vessels at 7,000 H.P., as far as the coal is concerned, should be, roughly: Hyacinth, 2,930 miles; Minerva, 3,000 miles. No difficulty was experienced in either ship at any part of the outward or homeward runs in keeping up a sufficient supply of coal to the fires.

An expenditure of about \$100,000 will be involved in rebuilding during the coming winter one of the large ore shipping docks of the Wisconsin Central Railway at Ashland on Lake Superior. Something over 5,000,000 ft. of timber will be used in the work. The entire structure will be raised 10 ft., making the top deck 66 ft. above datum and providing for the ready loading of the largest vessels now in commission or that are at all likely to be built.

THE CRUISER CLEVELAND.

A GENERAL DESCRIPTION OF THE VESSEL THAT WILL BE LAUNCHED AT BATH IRON WORKS, BATH, ME., ON SEPT. 28.

Arrangements are now being made for the launching of the cruiser Cleveland at the Bath Iron Works, Bath, Me. The date of the launch has been definitely set as Sept. 28, at noon. Senator Hanna has signified his intention to be present. His daughter, Ruth Hanna, will christen the vessel, which is the largest the Bath Iron Works has constructed to date. The company has invited Senators Frye and Hale and Representative Littlefield to be present. The six cruisers of the Denver class, of which the Cleveland is one, are in one respect, that of being sheathed and coppered, a radical departure from previous practice; and they are in all other respects up to date. For many years Rear Admiral Hichborn, while chief constructor of the navy, stood almost alone in his advocacy of sheathing for ships' bottoms, but persistent argument, combined with many object lessons from the reports of our ships in service, which tended

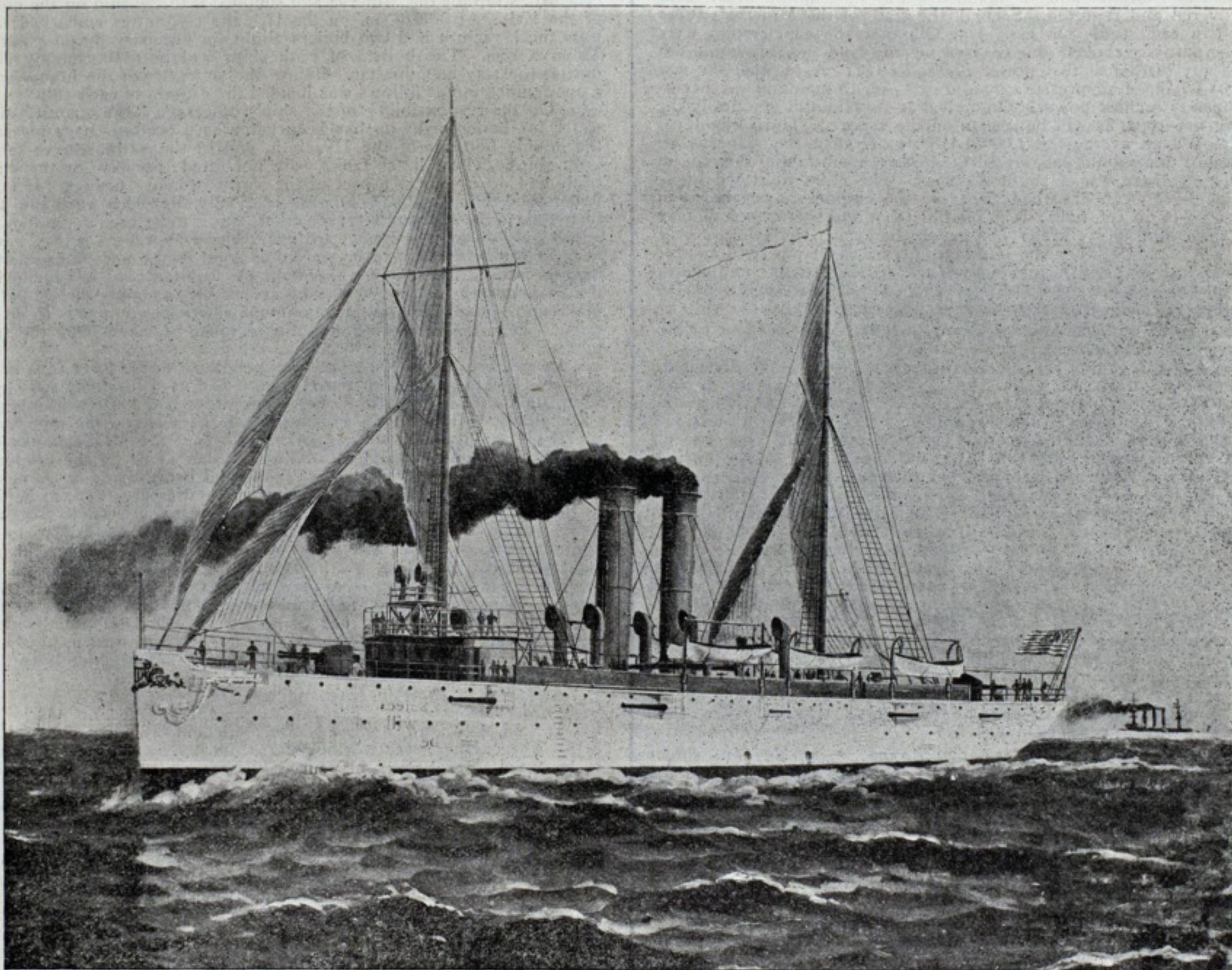
dedicated horse power, 4,500; type of boilers, water tube; number of boilers, six.

Main battery—Ten 5-in., 50-cal. B. L. R. F. guns. Auxiliary battery—Eight 6-pounder R. F. guns; two 1-pounder R. F. guns; four Colt machine guns.

Sail area, about 6,000 sq. ft.

The guns will all be designed for smokeless powder, and the 5-in. guns will be more effective than the old type of 6-in. guns. Eight of them will be mounted on the main deck in recessed ports, the four forward ones having a range from right forward to 60° abaft the beam, and the four after ones from right aft to 60° before the beam. The two remaining 5-in. guns will be mounted behind shields on the spar deck—one forward and one aft. Four 6-pounders will be mounted on the main deck—two forward and two amidship—and four more on the spar deck. The two 1-pounder guns will be mounted aft on the main deck, and the Colt machine guns on the top of the hammock berthing amidship.

The coal capacity of these ships with bunkers full (700 tons) is sufficient to give them a radius of action at full speed of about 2,600 miles.



CRUISER CLEVELAND, TO BE LAUNCHED SEPT. 28 AT BATH IRON WORKS, BATH, ME.

to prove the statements in favor of sheathing, have at last overcome the strong prejudice against it, and all of the twelve ships authorized by a late act of congress—three first-class battleships, three first-class armored cruisers, and six protected cruisers—are to be sheathed and coppered. The Denver class are vessels of about the size of the Raleigh and Cincinnati, but improved and modernized. The latter ships were designed at the time when the craze for speed at all costs reached its maximum, and to attain this extreme speed, which it will be noted could only be maintained for a few weeks after they were docked and cleaned, on account of their rapidly fouling unsheathed bottoms, too many other qualities were sacrificed, and they were later altered to remedy this defect. The Denver and her sister ships are designed for a speed of 16½ knots, but will only make 17 knots when pushed, while the Raleigh and Cincinnati were designed for a speed of 19 knots. The former will be able to maintain their designed speed practically indefinitely, while the latter could scarcely maintain a speed of 15 knots, and that with an excessive consumption of coal. The horse power required in the new designs is 4,500, as compared with 10,000 in the Raleigh and Cincinnati, which means less than half the weight of propelling machinery.

The general dimensions and features of the Denver class will be as follows: Length on load water line, 292 ft.; length, extreme, 308 ft. 2 in.; breadth, extreme, about 43 ft.; mean draught at trial displacement, two-thirds coal, ammunition and stores, 15 ft. 6 in.; extreme draught fully loaded, 16 ft. 8 in.; trial displacement, about 3,100 tons; full load displacement, about 3,400 tons; coal carried on trial, 470 tons; total bunker capacity, not less than 700 tons; speed on trial, not less than 16½ knots; type of engines, vertical inverted, four-cylinder, triple-expansion; estimated in-

At the most economical rate of steaming, probably in the neighborhood of 10 knots per hour, they will be able to steam about 9,800 miles without re-coaling, or more than sufficient to take them from San Francisco to Manila. The ammunition supply will be large, as it should be to make rapid-fire guns effective. For each of the 5-in. guns they will carry 250 rounds, and for each of the 6-pounders 500 rounds.

The wood material used in the construction of the hulls will be reduced to a minimum. All the bulkheads on the gun and berth decks will be of metal, and they will each be fitted with a pilot house on the spar deck built entirely of non-magnetic metal. Where it is necessary to use wood for any purpose it will be treated with the electric fire-proofing process before being worked. A water-tight deck covered with ½-in. plate will be worked from stem to stern, the sides sloping down to 3 ft. below the water line and the flat or midship portion rising 18 in. above the same. This will be on the line of the berth deck for the greater part of the length, but toward the ends it will slope down. On top of the water-tight deck at the sides a belt of obturating material will be worked, covering the water line for the whole length of the ship. All of the propelling machinery, steering gear and magazines will be below the water-tight deck. The rig will be two-masted schooner with signal yards on the foremast. Each vessel will have two search lights, an electric signalling system, and a complete installation of electric lights. The blowers for ventilation and deck winches will be operated by electricity. Each ship will carry one 30-ft. steam cutter; one 30-ft. launch; two 28-ft. cutters; two 26-ft. cutters; one 28-ft. whaleback gig; one 28-ft. whaleboat; and one 18-ft. dinghy. The complement will be twenty-seven officers, 238 seamen and twenty-five marines.

PRACTICALLY EQUAL TO LAST YEAR.

SHORTAGE IN LAKE SUPERIOR COMMERCE, DUE TO THE LATE OPENING OF NAVIGATION, IS ABOUT MADE UP—COAL AND GRAIN SHIPMENTS STILL SOMEWHAT BELOW 1900 FIGURES.

Notwithstanding the loss due to a late opening of navigation this year, the movement of freight to and from Lake Superior is now practically equal to what it was a year ago. If the canals at Sault Ste. Marie were all the time employed as they were during the month just past, they would show a season record of nearly 35,000,000 tons of freight, but it is not, of course, possible to keep up in spring and fall the volume of mid-summer business. August shipments through the canals aggregated 4,687,817 tons. This brings the total Lake Superior freight movement on Sept. 1 up to 16,236,009 tons (net tons in all cases), as against 16,490,020 tons on Sept. 1, 1900, and 14,418,477 tons on the same date in 1899. The iron ore movement is fully equal to 1900. The principal shortages are soft coal about 400,000 tons, and wheat about 11,000,000 bushels. In some other lines, less important, gains over 1900 are noted. A full summary of the traffic of both canals at the Sault, Canadian and United States, follows:

MOVEMENT OF PRINCIPAL ITEMS OF FREIGHT TO AND FROM LAKE SUPERIOR.

ITEMS.	To Sept. 1, 1901.	To Sept. 1, 1900.	To Sept. 1, 1899.
Coal, anthracite, net tons.....	389,036	376,836	507,703
Coal, bituminous, net tons.....	2,301,981	2,702,959	1,810,969
Iron ore, net tons.....	10,956,954	10,818,663	9,062,580
Wheat, bushels.....	15,695,526	27,005,111	24,825,894
Flour, barrels.....	4,045,311	3,301,858	3,705,457

REPORT OF FREIGHT AND PASSENGER TRAFFIC TO AND FROM LAKE SUPERIOR, FROM OPENING OF NAVIGATION TO SEPTEMBER 1 OF EACH YEAR FOR THREE YEARS PAST.

EAST BOUND.

ITEMS.	Designation.	To Sept. 1, 1901.	To Sept. 1, 1900.	To Sept. 1, 1899.
Copper	Net tons....	50,823	77,198	63,859
Grain, other than wheat	Bushels....	7,671,110	5,824,151	16,229,883
Building stone	Net tons....	23,859	19,131	17,778
Flour	Barrels.....	4,045,311	3,301,696	3,704,107
Iron ore	Net tons....	10,956,954	10,818,663	9,062,580
Iron, pig	Net tons....	20,291	11,584	15,926
Lumber	M. ft. b. m.	606,304	488,133	588,747
Silver ore.....	Net tons....			
Wheat	Bushels....	15,695,526	27,005,111	24,825,894
Unclassified freight	Net tons....	34,433	36,364	87,437
Passengers.....	Number....	20,304	21,414	18,408

WEST BOUND.

Coal, anthracite.....	Net tons....	389,036	376,836	507,703
Coal, bituminous.....	Net tons ..	2,301,981	2,702,959	1,810,969
Flour	Barrels	180	162	1,350
Grain	Bushels.....	55,930	18,584	26,500
Manufactured iron.....	Net tons....	69,691	75,637	98,662
Salt	Barrels	271,348	176,734	189,932
Unclassified freight.....	Net tons....	277,090	247,624	239,566
Passengers	Number ...	22,167	22,529	20,060

SUMMARY OF TOTAL FREIGHT MOVEMENT IN TONS.

	To Sept. 1, 1901.	To Sept. 1, 1900.	To Sept. 1, 1899.
West bound freight of all kinds, net tons.....	3,079,734	3,433,946	2,686,443
East bound freight of all kinds, net tons.....	13,156,275	13,056,074	11,732,034
	16,236,009	16,490,020	14,418,477

	Vessel passages.	Registered tons.
To Sept. 1, 1901 ..	11,742	14,141,814
To Sept. 1, 1900 ..	12,337	14,319,248
To Sept. 1, 1899..	11,856	12,673,275

Judges of United States courts, admiralty lawyers, libraries all over the country, ship builders and ship owners, are ordering Patterson's Nautical Encyclopedia, recently published by the Marine Review. The sale of this work exceeds all expectations. It will be forwarded to any address upon approval. The price, \$3.00, places it within reach of everybody requiring such a book. Geo. H. Hitchings, ship builder of Hoquiam, Wash., says: "I believe Patterson's Nautical Encyclopedia, which I have just received, is the best work of the kind to be found anywhere, and it is up to date. Please send me another copy for a sea-captain, a friend of mine."

The cruiser Columbia has been formally placed in commission as a receiving ship at the New York navy yard.

RETIREMENT OF CAPT. CALVIN CARR.

Capt. Calvin Carr, for thirty years a vessel agent in Chicago, has retired from business, going back to Oswego, at which place he entered service on the lakes a half century ago. Thursday, Sept. 5, Capt. Carr's friends tendered him a farewell dinner at the Grand Pacific hotel, Chicago. Thirty people connected with the grain shipping business attended. Homer H. Peters of Bartlett, Frazier & Co., presided. Capt. Carr was presented with a heavy gold chain and Masonic emblem, as a token of appreciation by his friends on 'Change.



Last year Capt. Carr bought a beautiful farm within a mile of Oswego, and this will be his future home. He began sailing when sixteen years of age, and by the time he was able to vote he was in command of the schooner Augustus Ford. He sailed many vessels in the general lake trade, the last being the schooner Marengo. He moved from Oswego to Chicago in 1866, and five years later became a member of the board of trade. He was with W. M. Egan for a number of years, and in 1881 he went into business for himself. He always preserved the utmost confidence of his principles in the handling of vessels in Chicago, while at the same time shippers held him in the highest esteem on account of his uniform fair dealing. This was the second farewell dinner given in Chicago this summer, the first being to T. T. Morford, who went to Buffalo. The two men were the longest in continuous service of any vesselmen on the floor of the board of trade.

AROUND THE GREAT LAKES.

The steel steamer Yosemite, a sistership of the Colonel, and which will be managed by Mr. A. McVittie of Detroit, was launched at Wyandotte Saturday.

J. B. Merrill, formerly a partner of R. P. Fitzgerald, and an old-time vessel owner, died at his home in Milwaukee Monday. He was seventy-six years old. Mr. Merrill had not been connected with vessel matters for the past five years.

Capt. Riley Phillips, aged seventy-two, died at Benton Harbor Thursday last. He had sailed for many years in the Graham & Morton and Goodrich lines, and many years ago sailed the steamer Jay Gould in the grain trade between Chicago and Buffalo.

Frank Hackett of Amherstburg, formerly mate of the steamer John Oades, has been selected to take charge of the steamer Kewaunee, which the Lake Carriers will use as a light-ship on South-east shoal, Lake Erie, and which will be in service in a few days.

The United States lake survey steamer Vidette reports a small shoal in the Apostle islands, 3.6 statute miles north, 44 degrees east, true (N. E. $\frac{1}{8}$ N.), from the north point of Galt island. It is about 100 ft. in diameter and consists of a cluster of boulders, with a least depth of 19 ft. at the present stage of water in Lake Superior.

Capt. Curtis T. Grover, seventy-two years of age, died at his home in Cleveland on Friday last. He had sailed the lakes since the early '50s. As far back as 1856 he was master of the Ironsides, which was a famous boat in its day. He also commanded later the Kingfisher, the Charles Wall, the Helena and last of all the propeller Keystone.

During the balance of the season the City of Buffalo of the Cleveland & Buffalo Transit Co. will be operated under her low pressure cylinder only. On the run to Buffalo on Tuesday the steamer broke the cross head of her high pressure cylinder and had to be towed back to Cleveland. No damage whatever was done to the vessel, owing to the fact that the condition of the cross head was discovered by an oiler just before the fracture occurred and steam was promptly shut off.

It is, of course, well understood that shipments of both hard and soft coal to Lake Michigan ports are very much short of requirements. Chicago receives very little soft coal by lake, but the hard coal business of that harbor is quite an important item. A statement just published shows a shortage at Chicago and South Chicago to Sept. 1 of 214,427 tons, or a falling off of about 30 per cent. from last year. The figures are: Coal received to Sept. 1, 1900, 666,260 tons; received up to Sept. 1, this year, 451,833 tons. Waukegan has done fairly well, having received 60,450 tons up to Sept. 1.

Capt. Geo. P. McKay, chairman of the committee on aids to navigation of the Lake Carriers' Association, has received the following letter from the government engineer office at Detroit, which is self explanatory: "The examination of the channel between the north end of the Lime-Kiln crossing and the south end of Bois Blanc island to locate obstructions to navigation, has been completed. Several small boulders were found and removed. Nearly all of these boulders were approximately in the location indicated by vessel captains. At Amherstburg, however, the most of the striking was apparently along the line of the floats marking the west limits of the channel. The least depth of water over obstructions removed at the mean stage prevailing during the month of August was about 18 ft. At this stage of water there is a present clear depth of 18.5 ft. throughout this part of the channel. It must be expected, however, that from now until the end of the season a lower stage of water will prevail."

A GREAT VESSEL ORGANIZATION.

HISTORY OF THE CITY LINE, WHICH MR. ELLERMAN (AND NOT MR. J. PIERPONT MORGAN) HAS PURCHASED—A MAGNIFICENT FLEET.

Whenever a steamship line changes hands nowadays the newspapers are sure to say that it has been bought in the interests of Mr. J. Pierpont Morgan. When Mr. Ellerman, who lately sold the Leyland line to Mr. Morgan, purchased the City line of Glasgow it was blithely stated that he was acting as agent for Mr. Morgan. However, he was doing nothing of the kind. Having made an agreement with Mr. Morgan to stay out of the Atlantic trade he had invested the money secured by the sale of the Leyland line in the Indian trade. But there is no gainsaying the fact that Mr. Morgan has the center of the stage with the calcium trained on him in addition. A London paper in a facetious mood says that Mr. Morgan has decided to give the Thames a new service and for the construction of the vessels has purchased one of the largest ship yards on the Clyde, has engaged a Royal Academician to paint the funnels and a syndicate of great masters to do the interior decorative work.

The story of the City line, which Mr. Ellerman has just purchased, is well worth reading, since it goes back to the beginning of the Indian trade and shows how a magnificent fleet may be built up from a small start. Fairplay of London relates its history as follows:

The sale of the City line of steamers, managed by Messrs. George Smith & Sons, Glasgow, marks the close of an interesting chapter in the history of British merchant shipping. It opened in 1840, in which year also was born the Cunard line—another concern of Scottish evolution, if not origin. In the first half of the nineteenth century a young man, called George Smith, left his native place—Saltcoats, on the Ayrshire coast—where also were born the founders of the Allan line—and established himself, with his brother Robert, as a draper in a small way in the east end of Glasgow. The brothers were industrious and sagacious and the business prospered until it grew into a large establishment. In course of time George Smith took his two sons into partnership, and the operations were transferred to a big warehouse in the center of the city, Jamaica street. That business is still carried on under the firm name of Smith, Sons & Laughland, but we understand the Smiths have not been connected with it for many years, having become wholly immersed in shipping, though not until they had also prospered as cotton spinners. The change from soft goods to ships originated in a curious manner. One of the customers of the original firm got into difficulties and was unable to meet his bills for goods supplied by them. He tendered in liquidation, or in part payment, an old Canadian-built barque of some 300 tons. By this time the two sons of George Smith were actively engaged in the business and they saw their way to make something out of the ship. She was taken over and managed so successfully that a year or so later they bought another, slightly larger, which was being built in a Clyde yard, and they gave orders for another still larger—a full-rigged ship of 500 tons. With these three vessels—wooden, of course—was begun the City line. The City title was not adopted till later, and the occasion of its adoption is worth recording. It was after the three pioneer sailers had been working for seven or eight years that Robert Smith, who had entered the town council and was taking an active part in public affairs, became a bailie of Glasgow. The municipal boundaries were being enlarged about the same time by the absorption of two or three of the then suburban burghs. In one of these burghs was the ship yard in which at the time the firm were building the first of a new set of ships that were to be larger and finer than any they had yet owned. The circumstances suggested the naming of this ship the City of Glasgow, and from that time onwards all the vessels of the flag, both sail and steam, have been named after some city in Europe or India. They soon became specially identified with the Indian trade. At first they were placed in the hands of loading brokers, who berthed them for India or the colonies according as cargo offered, and from India or the colonies they returned with produce to London on charter. But after awhile George Smith & Sons got dissatisfied with this method of doing business, and as merchants they chafed, as others did, under the vexatious delays which were constantly occurring in the despatch of vessels placed on the berth by loading brokers, who practically monopolized the general cargo trade. Under the prevalent system a vessel was often not despatched until weeks after her advertised date, as the brokers would not send her away until she was full, no matter how the owners stormed and merchants swore. Smith & Sons determined to put an end to that sort of thing as far as their vessels were concerned. They took the loading into their own hands, and placed them on the berth to load for Calcutta, to sail on fixed dates full or not full. They kept faith with the shippers, and therefore the shippers supported them and the loading brokers were left behind.

This was about 1845, when, however, Smith & Sons had not enough ships of their own to maintain a monthly sailing, and a regular monthly sailing from Glasgow to Calcutta was necessary to keep the trade in hand, and especially to prevent the undercutting of rates by vessels being placed on the berth promiscuously. At this time Mr. John Campbell of Greenock was managing owner of three or four ships of much the same size and character as Smith's, and suitable for the Indian trade. An agreement was come to for the maintenance of regular sailings by combining the two little fleets and loading them outwards in the order of their arrival home. This arrangement lasted for a few years, during which Smith & Sons added to their fleet, and Campbell's co-partnership added other vessels, such as the Bucephalus, the Jane Ewing and the William Connal. The two last-named suggest that among Campbell's co-owners or financial supporters were the late James Ewing, of the great West Indian firm of James Ewing & Co. (after whose wife the Jane Ewing was called), and the late William Connal, head of the old firm of William Connal & Co., sugar brokers and produce merchants. The Bucephalus of her day was commanded by Capt. Thomas Skinner, who left the sea to establish the now well-known shipping firm of Thomas Skinner & Co. of Glasgow and London. But the co-operative sailing partnership between the Smiths and Campbell did not last very long. Early in the fifties they disagreed and parted company. John Campbell went to Liverpool and devoted himself to the China trade. He owned, among other vessels, the famous tea-clipper Fiery Cross.

In breaking down the monopoly of the loading brokers, George

Smith & Sons, with the City line, opened a new epoch in our ocean trade. It paid them, for shippers always gave their vessels the preference, and they prospered amain in spite of the dismal prophecies of the discomfited brokers. In order to keep up the regular service Smith & Sons had often to charter before their own fleet became large enough—and perhaps they sometimes lost on their charters, though eventually remunerated by concentrating the Clyde and Calcutta trade in their own hands. They went on building and buying as fast as they could find the money until they were able to maintain monthly services with Bombay as well as with Calcutta. Before iron came into vogue they had under their charge (owned mainly by themselves and their friends the Allans) a fleet of thirty-five smart East Indiamen, splendid ships, well-manned, well-provisioned, and well-managed. These ships established a reputation for seaworthiness, efficiency, and punctuality, that the line has never lost. At that time the average run from Clyde to Bombay was 106 days, and from Clyde to Calcutta ninety-five days, but voyages are on record of eighty-three days to the former and seventy-nine days to the latter, round the cape, of course.

Then in 1856 they began to change gradually from wood to iron, and in the course of some ten years or so they had converted the fleet entirely into one of large iron clippers, remarkable for the beauty of their lines and the great spread of canvas they could carry. The last sailing vessel for the City line was built in 1868. The time for another great change had come. But even after they went in for steam on their regular lines the Smiths retained their sailing ships for many years, as if loth to part with old and faithful friends.

When they did decide to adopt steam the Smiths were prompt and energetic. They began by ordering four boats of 2,300 tons and 1,000 H.P. each—large boats for their time. This was in 1871, and in a year or so two others were built. By 1875 they had ten steamers, each of them about ten times the size of the little wooden barque with which they began business as ship owners. These ten steamers were all built by Messrs. Barclay, Curle & Co. and Messrs. Charles Connell & Co. When they ceased to build sailers the Smiths had twenty-nine iron sailing vessels, ranging from 500 to 1,500 tons each, of which twenty-one were built by Messrs. Barclay, Curle & Co., and eight by Messrs. Alex. Stephen & Sons. It was just about the time when George Smith & Sons began to change their Indian clippers for steamers that Messrs. Thomas Skinner & Co. started their Castle line of steamers to China.

Of course the City line was not the first to send steamers to India. In fact, the first steam voyage to India was as far back as 1825, and of that voyage a Scotch newspaper in that year said, under date Nov. 30: "The steam voyage to India promises ill in its first stage. The Enterprise left England on Aug. 16 and had not reached the cape, which is rather less than half way, on Sept. 29, six weeks after her departure. It is not likely that she will complete the voyage to Calcutta in less time than the sailing vessel, that is, four months; and the probability is that she will require a month or two more. Till the Egyptian canal opens a much shorter route, or till steam navigation receives some grand and unexpected improvement, nothing will be gained by steam voyages to India." Well, the Egyptian canal did open a shorter route by the time the City steamers were ready. These boats then made the voyage from Calcutta to London without breaking bulk, and by not touching anywhere they secured the preference by the tea shippers when the Indian tea trade began to develop. By the careful selection of cargo and avoidance of stoppages en route the City liners secured and have retained the cream of the Indian tea trade. It says much for the excellent management of this line that it has always been popular among Anglo-Indian passengers, even though conducted on strictly teetotal principles. No liquor was allowed to be sold on board, though there was no rule to prevent a passenger carrying his own supply.

The first vessel actually built to the order of George Smith & Sons was the Majestic, a full-rigged ship of 500 tons, in 1846. The first "City" was the sailer City of Glasgow, built in 1848. The first steamer was the City of Oxford, 2,300 tons, built in 1870. The largest steamer built by the firm was the City of Corinth, 6,400 tons. In a letter to Mr. Shaw Lindsay, written in 1875, George Smith the second wrote: "For several years our operations were confined to Calcutta, but in 1863, at the solicitation of several friends, we started a monthly line to Bombay, having in the meantime increased our sailings very materially to Calcutta as well. The following statement shows the number of voyages to each port completed in 1871, and is a fair estimate of the work of the previous eight years:

CALCUTTA.

"Despatched sixteen sailing ships completing the same number of

Shortest passage out.....	79 days.
Shortest passage home.....	93 days.
Shortest round voyage.....	6 months 9 days.
Average passage out.....	95 days.
Average passage home.....	108 days.

"Five of the voyages were completed under seven months. A few of these vessels loaded out from London. The others were all from the Clyde.

BOMBAY.

"Despatched sixteen sailings ships completing the same number of voyages.

Shortest passage out.....	83 days.
Shortest passage home.....	95 days.
Average passage out.....	106 days.
Average passage home.....	117 days.
Shortest voyage home.....	7 months 18 days.

"We had in fact a virtual monopoly of the trade, gained by strict punctuality, a high class of ships, and moderate charges, ever studying to arrange rates that our friends could not go past us to do better. Our first iron ship was launched in 1856; our wooden ones were disposed of as opportunity offered, and in 1868 only one of those remained, which we have since sold. We commenced steam in 1871 by contracting for four boats of 2,250 tons gross and about 1,700 tons register, having compound engines of 200 H.P. working up to 1,000."

The writer of this letter died in 1876. He was succeeded by his son George, third of that name, who was No. 23 of the Clydeside Cameos, first series. This much respected gentleman died in 1899, and the present firm consists of his two sons, George and Robert Smith, and Mr. W. S. Workman. Until a few years ago Mr. Robert Smith Allan, son of Mr.

Alexander Allan, of J. & A. Allan (the Allan-State line) was also a partner. Mr. Nathaniel Dunlop of the Allan line married a sister of the late Mr. George Smith, and the connection between the two firms has always been very close. The City line of steamers was a few years ago converted into a private Limited Liability Co., managed by George Smith & Sons. The fleet which has just passed over to Mr. Ellerman aggregates now close on 70,000 tons, and the flag which is about to be hauled down has flown for sixty-one years without a stain.

SUBSIDIES TO FOREIGN SHIPPING.

CONSUL GENERAL WILLIAM WARD RENDERS AN EXHAUSTIVE REPORT TO THE BRITISH GOVERNMENT—ALL GERMAN SHIPS ARE SUBSIDIZED.

In the replies made by British representatives abroad to Lord Salisbury's letter in regard to the payment of subsidies to shipping, some interesting facts are set forth. Sir F. Lascelles, the British representative at Berlin, transmitted with approval a reply prepared by William Ward, the British consul general. As if to meet the unfounded statement that Germany pays only postal subsidies Consul General Ward in the beginning of his reply says:

"The German government memorandum submitted to the imperial parliament with the bills proposing the grant of subsidies to the North German Lloyd Co. in 1885, and to the German East Africa Co. in 1890, expressly states 'that the annual sums to be granted as postal subventions in Germany cannot be regarded merely as a payment for services rendered,' that is to say, for carrying the mails; that these sums were asked 'for establishing and subsidizing German mail steamers.' This was fully recognized by the German legislative assembly, to whom the bill was submitted, and no one assumed that the subsidy was merely the value of the postal service, but it was looked upon as 'value also paid for important interests of the German export industry, the requirements of the navy, and of a colonial policy,' etc.

Consul General Ward demonstrates that Germany pays a much larger sum in subsidies than appears on the surface, and that all German ships in the foreign trade, including those running to the United States, participate in this indirect subsidy. He says that "it cannot be expressed in figures, inasmuch as this bounty is granted in the form of exemptions from payment of customs duties and preferential railway rates." Articles imported for use or in the construction of ships, or for their equipment, are admitted free of duty. This is done also in the construction of foreign ships of war in German ship yards. State assistance is further granted by preferential rates of German railways for articles for use of the steamship companies or for the construction of ships and for goods for export.

Consul General Ward says that the indirect bounties in the way of preferential railway rates have been of immense advantage to the German ships engaged in the African and Oriental trade. He says: "This assistance is given by granting largely reduced rates of carriage by all German state railways to goods exported from inland places of Germany on through bills of lading. These combined, land and sea, through rates of freight are lower than those in force for goods sent to German ports for direct exportation by sea. This preferential rate is only given to goods shipped by German steamers." He adds that "the effects of this state assistance in the form of preferential railway rates for goods exported by these subsidized lines to Africa and the Orient, are clearly perceptible in the large increase in the volume and value of the exports to those countries, since the subsidies were granted." For instance, in eight years the exports to East Africa increased nearly 500 per cent. in volume while the return cargoes increased 200 per cent. in volume. The tonnage of the steamers employed increased in the same time about 600 per cent.

The business by the subsidized North German Lloyd line to Asia in five years time increased 250 per cent. outwards and 100 per cent. homewards. The subsidized North German Lloyd line to Australia shows like results. Consul General Ward says: "Statistics of the goods traffic of the German Lloyd line (subsidized) are not procurable, as the company declines making them public. The figures giving the amount of tonnage employed renders it evident, however, that the sea-borne trade carried on by the steamers of this company has steadily increased."

The total annual amount of direct bounties paid by the German government aggregates nearly \$2,000,000, but that does not include the \$325,000 paid by the German post office to the Hamburg-American and North German Lloyd steamship companies for the carriage of German mails from Hamburg and Bremen to America. The return mail carried by these companies is paid for by the United States and other countries in which the mail originates. Consul General Ward states that the North German Lloyd line "made an arrangement with the Hamburg-American line by which the same has taken over a part of the subsidy granted to the North German Lloyd for a fortnightly service to China and Japan, in consideration of furnishing a certain number of vessels for this new service." The German steamship companies all work in harmony and are in close relations with their government. The consul general adds: "The figures and observations which I have submitted will sufficiently prove that the direct and the indirect bounties granted by the state to the several German steamer lines referred to have been of very valuable use toward developing German trade." The tonnage of German merchant ships in the foreign trade has largely increased, while that of the United States has decreased, though our foreign-carrying trade is vastly more important than that of Germany. The German increase would have been much greater than it is, excepting for the fact that the German-owned shipping in the Baltic ports decreased from 449,000 tons in 1871 to 270,000 tons in 1896, owing largely to change of laws by Russia and other countries.

Some of the witnesses before the parliamentary committee, investigating the subsidy question, illustrated how the German preferential railway rates helped German shipping. James Knott, a steamship owner representing the North of England Steamship Owners' Association, said: "Cargoes which we used to get from Antwerp are now diverted to Hamburg on account of preferential railway rates, which are tantamount to a subsidy. Some time ago there was a new railway to be built in Turkey, and there was a lot of railway material to be carried from Antwerp. At that time my company had an arrangement with German steamship

owners to run on an equality of rates, but railway material was not covered by the arrangement. I was competing for the railway material, but the Germans got it. I was told that the Kaiser himself wrote a letter in his own hand to the Sultan of Turkey in favor of the German line. The Germans, from the Kaiser downward, are doing everything possible to promote German trade. Our trade is slipping away out of our hands—a little here and a little everywhere, and it seems to be nobody's business to take care of it. I believe that the immediate effect of the passage of the shipping bill pending in the American congress will be the transfer to the American flag of a good many ships built by British companies in this country. I know that some owners interested in the American trade have made arrangements to register their vessels under the American flag."

Mr. Knott, asked what remedy he proposed, on behalf of Great Britain, for this state of things, said: "I regret very much that there is not a minister of commerce or department of commercial intelligence in this country with whom traders can take counsel. The board of trade is a misnomer; it is really a board of labor. They pay no attention to the shipping industry. The chambers of commerce are pre-Adamite. The great percentage of the members of chambers of commerce have no direct interest in the matter. Subsidies might be one remedy among others, and a good system of through preferential rates might be another. The payment of subsidies helped the mercantile marine, and also to develop an export trade. They had helped Germany and Italy. In France subsidies had benefited the navy though I do not know whether they have helped the trade of that country. Austrian bounties have made havoc of a very nice trade which used to be done by British vessels to and from Austrian ports, notably in carrying cargoes of cotton from New Orleans to Trieste. The Brazilian government has passed a law providing that no vessels other than Brazilian shall be allowed to carry coasting cargoes, and that has had serious results in British trade. Vessels of mine used to run from New York to the Brazils, calling at Pernambuco, and made as much as £2,500 (\$12,500) per voyage. That has been lost. On the voyage to New York the Italian vessel gets £500 (\$2,500) per voyage and to the River Platte, £669 (\$3,345). To that extent my own vessels are handicapped where they engage in the same trade."

Colonel J. Goffey, chairman of the Liverpool Ship Owners' Association, complained that French sailing vessels receiving bounties from the French government engaged in the British trade and made their profits almost altogether out of the bounty paid by the French government. He said that this explained the fact that while in 1892 apparently no French sailing vessels were produced and 124 British sailing ships each of 1,000 tons and upward were built, the production of French sailing vessels had since gradually increased while that of England had declined, so that in 1900 the French produced thirty-eight sailing vessels each of 2,000 tons or more, while the British produced only four sailing vessels of 1,000 tons or more each. He said that there was a strong feeling among British ship owners that in every respect foreign vessels coming to British ports should be made to comply with the British load line law and every other requirement imposed on British shipping. While personally a free trader and opposed to subsidies, rather than see British trade diminish he might favor the policy of subsidies.

C. H. Wilson, for twenty-seven years a member of parliament, and director of Thomas Wilson & Sons, owners of a large number of steamers trading to Norway, Sweden, the Baltic, Bombay and America, testified that in competition with the Norwegian steamships they lost money, excepting during the tourist season, but the losses made on the Norwegian line were recouped by the steamers running to America on which goods were transhipped from the line to Norway, an illustration of how Americans are made to pay for losses the line makes elsewhere. Mr. Wilson expressed the opinion that the British ought to follow the example of Germany in promoting the shipping industry.

A. E. Bateman, controller general of the board of trade, gave a good deal of information on the subject of foreign subsidies and disclosed the fact that some countries gave indirect subsidies to their shipping by paying for their ships' Suez canal dues and light dues. The witness gave statistics of the trade of Zanzibar, Mombasa, Jiddah and other ports where Germany and other countries had gained at the expense of England.

The British consul at Nagasaki expressed the opinion that there could be no better national investment than a subsidy for a British steamship service to Japan. He said that the subsidized German service from the far east was better and cheaper than the subsidized British service.

It was brought out in the parliamentary investigation that all nations were now pursuing the policy of limiting their subsidies to vessels built in such nations, so as to promote ship building. France, Italy and Germany have changed their laws so as to limit their government aid almost wholly to home-built ships, and in all cases the home-built ships are paid the highest rates. The policy was at the start to give a smaller subsidy to foreign-built ships in order the more quickly to build up a national merchant marine. The French system of subsidies gives proportionately more aid to sailing vessels than to steamships, which is one reason why it has been a partial failure. No other nation follows that course. But as explained before the parliamentary committee, the French subsidies have prevented a great decline in French shipping, which decline was going on before subsidies were adopted. It was proved beyond dispute that the great increase in German shipping has all taken place since the subsidy policy was adopted, and is almost altogether due to that policy.

The equipment department of the Charlestown navy yard finished this week the largest anchor ever made. For nearly two months men have been working on the big "mud hook," and on Monday the job was completed by welding the crown and shank. The anchor measured about 16 ft. in length, and will probably be sent to one of the new battleships or armored cruisers. It is unlikely that a larger size will be attempted for some time, if ever.

It is now certain that a large steel freight steamer, upon which work was begun only a couple of months ago by the American Ship Building Co. at its Lorain yard for the Mack estate of Cleveland, will be completed in time to make several trips before the close of navigation this year. The vessel will be launched next week and will very probably undertake her maiden voyage about Oct. 15.

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The attempted assassination of President McKinley is a crime which is beyond the comprehension of a sane mind. Why this man whose whole life has been a blending of kindness and conciliation should be shot down passes understanding. A healthy mind before it acts wants a tangible achievement for its reward. There could have been no possible accomplishment in compassing the death of the chief executive—a calamity which, thanks to a rigorous constitution and an abstemious life, is most happily averted. It was a senseless, cowardly thing to attempt—the act of a mind diseased by wrong living and wrong thinking. We do not believe that the assassin had an accomplice. He is merely one of these weak-minded creatures rendered delirious by anarchistic teachings and swayed by a stronger mind as a reed is swayed by the wind. He belongs to that class of unfortunate creatures who regard their employers as their natural enemies and who, therefore, look upon one vested with authority as hostile to them. Against the president personally neither Czolgosz nor anyone else could possibly have had a grievance which would lead them to desire his life. His personality is the most charming imaginable and it is absolutely beyond him to wittingly give offense to anyone. This danger which menaces the lives of rulers is a rooted one. That it has nothing to do with persons is exemplified in the fact that so blameless a life as McKinley's should have been selected for sacrifice. The cause of the trouble is the tons of anarchistic literature which finds its way into the United States mails every day in the year—literature so vicious as to be utterly lacking in the least shred of morality—and which indeed to a well-ordered mind defeats its own purpose by the very violence and injustice of its language. But unfortunately every one's mind is not well-ordered. If it were there would be no anarchists. This seething mass of pernicious doctrine must from its very profusion fall upon some soil already fallowed for it by suspicion and ignorance. It is here where the teaching works its mischief, for it inspires some wretch to action who has not the strength of mind to perceive the dreadful nature of his intellectual company. Surely the law has power enough to stop this. These publications are a gross violation of the spirit of the liberty of the press. They are the breeding-ground of all that menaces the security of the nation. Why should they be given the use of the mails? There is no other question which comes so closely home to the people of the United States. Of the last seven of our presidents three of them have been shot. This is an appalling percentage and calls for radical action.

On the other hand, it is probably the gentleness and charm of the president and the great measure of personal affection that he has won from the people that have called forth from several distinguished persons statements equally as wild and violent as those of the anarchists themselves. Senator Thomas C. Platt, the senior senator from New York, and Gov. Odell of that self same great state, are quoted as saying that the assassin should have been lynched; the Rev. T. De Witt Talmage wanted his brains butted out with the very revolver with which he shot; the Rev. R. H. Naylor, who presided this week at President McKinley's church in Washington, wanted the scoundrel blown to atoms; while the New York Herald urged in an editorial the revival of some slow torturing form of death for crimes of this character. The president's life is no more sacred than that of the humblest citizen, while over and above all is the tenet of our majestic constitution that "no person shall be deprived of life, liberty or property without due process of law." No good will come of any sanction of lawlessness or any revival of a barbaric form of torture. The mere assassin is an atom whose life, whether forfeited or not, has no weight whatever; it is the principle behind him which should be suppressed.

The Kronprinz Wilhelm of the North German Lloyd, which is superior to the Kaiser Wilhelm der Grosse as regards size and speed, and was built for the purpose of eclipsing the Deutschland, has just gone on a short trip from Bremerhaven to Bergen. She will start on her maiden trip across the Atlantic on Sept. 17 and her performance will be watched with a great deal of interest. On a trial trip from Bergen to Leith she reached a speed of nearly 24 knots an hour without forced draft, justifying the belief that she is the fastest merchant vessel in the world.

It is quite likely that the battleship Illinois will be ordered to the Mediterranean to replace the cruiser Chicago as the flagship of the European squadron.

GROWTH OF PACIFIC TRADE.

We are prone to forget the comparative newness of the development of the industries of the United States, and an article such as the following from the Journal of Commerce comes in the nature of a surprise. But we are, indeed, very, very young yet:

The very interesting array of facts and figures furnished by a Seattle correspondent in regard to the activity of ports of the Pacific coast suggests, among other things, a serious awakening as to the possibilities of Oriental commerce on the part of the nearest commercial neighbors of Asia. It has taken some time to bring this about, and but for the competition for Asiatic freight among the transcontinental railroads, and the substantial evidence given by these great corporations of their faith in the future of our business dealings with the far east, the awakening would probably have been less thorough. Now that the enterprise of the Pacific coast states is being stimulated from without and from within, the expectations that were early formed of its future triumphs may at last be realized. It is but fair to remember that the foreign commerce of these states is of very recent origin. As late as 1860 there were only twenty-three miles of railroad west of the Rocky mountains, and it was not until 1861 that the first telegraph line from the east reached the Pacific coast. It was on Jan. 1, 1867, that the first steamship of the Pacific Mail sailed out of the harbor of San Francisco, and only four years ago the English statistician, Mulhall, writing about the progress of the Pacific states, found that all their foreign commerce was concentrated in San Francisco, and that the other ports had no trade worth mentioning. The actual growth of population between 1890 and 1900 in the three states of California, Oregon and Washington, was a good deal less than had been generally estimated; but it amounted to 29 per cent., against 20 per cent. for the country at large, and the ascertained total was 2,416,692. Of the three states, California shows fewest signs of progress, the growth of population in the state at large being only 23 per cent., and in the city of San Francisco less than 15 per cent. In ten years San Francisco has dropped two points in the scale of urban rank, having been the seventh city of the Union in 1890 and the ninth in 1900. On the other hand, Los Angeles has come forward with a rush, having a population of 102,479 against 50,395 in 1890, while Portland follows hard upon with a population of 90,426 against 46,385, and Seattle makes a good third with 80,671 against 42,837.

Our correspondent points out that in 1891 there sailed from the Pacific coast for Asia steam vessels making forty clearances of 92,061 net tons, and these all from San Francisco with one small exception. In the present year, on the regular lines alone, there are scheduled sixty-one large steamships plying across the Pacific, nineteen going through the Suez canal to England, and the remainder to Hongkong and other East Asiatic ports and return. These make 250 round trips a year on the Pacific; the actual regular sailings for the next three months making an entrance and clearance of Pacific liners at Pacific ports, every other day, of 6,800 tons freight-carrying capacity. Moreover, half the steam merchant marine tonnage building today in the United States is for the Pacific. The northern ports show most of this gain, having in the last ten years increased their regular liners to forty, while, excluding the unsettled Siberian railroad connection, the southern ports count only nineteen steamships. The growth in the volume of the Asiatic trade—a considerable portion of which still goes from Atlantic ports by way of Suez—has been more rapid than that of any other great department of our commerce. The imports have increased from \$80,000,000 in the fiscal year 1892 to \$140,000,000 in 1900; and the exports from \$19,000,000 in 1892 to \$65,000,000 in 1900. That a very large proportion of Asiatic imports does not come by the Pacific is obvious from the fact that, as entries at Puget Sound port show, the amount of tonnage coming that way from Asia in 1900 was only 407,243 tons net, against clearances of 548,170 tons. In the last fiscal year 173 vessels of 298,844 tons arrived from Asia in ballast. It is explained that the discrepancy between entrances and clearances shows that a large number of sailing vessels cleared for other ports than those of Asia, but it also shows that most of the large import cargoes from the British and Dutch East Indies find their way by the Suez across the Atlantic.

The question is pertinent, "Will not the Pacific extend the grasp of its liners south of Hongkong?" Probably not, while freights from New York to Shanghai are cheaper by way of Suez than by the Pacific. In the one case the distance is 12,360 miles, and in the other, via San Francisco, only 9,920 miles; but the fact that 3,250 miles of the latter route is by rail, throws the advantage in cost of transportation on the side of the all-water route. The place of origin, however, of most of the freight for the far east is the south, southwest and northwest, and there is no reason why the railroads converging at San Francisco or Puget Sound should not, with their steamship communications, compete with the tramp steamers from New York in carrying all of that freight. If the recent combinations made by the transcontinental lines have any commercial import, it must be toward a more nearly complete command of the traffic to and from the eastern shores of Asia. Nor is it unreasonable to assume that there is feasibility at least in schemes to extend the range of the Pacific carriers to the East Indies. San Francisco is 1,000 miles nearer Singapore, the clearing house for a large part of the East Indian Archipelago, than any of the ports of Northern Europe. For our North Atlantic ports, even a trans-isthmian canal would leave all Asiatic ports west of Hongkong nearer by way of Suez than by way of the Pacific. But the combination of railroad and steamship transportation which is being pushed so vigorously ought to make the Pacific route the cheaper as it is the shorter for all Asiatic trade sent from or destined to any part of the United States west of Chicago. Those who look for a great economic and social development among the still dormant countries of the far east are sustained by the examples of Japan and India. Within living memory the whole foreign trade of India has changed, and the commercial and industrial revolution is still in progress in Japan. It will follow upon the heels of the railroad contractor in China. The question has been asked, with obvious force: "Do we realize all that is implied in the fact that of about 470,000 miles of railway in the world Asia has not more than 34,000; that while Europe has a mile of railway for every 2,400 inhabitants, and the United States for every 400, Asia has one only for every 28,000?" The very thought of the work involved in remedying the disproportion is overwhelming; but when we know what railways and steam and mechanical invention have done for the peoples in the Atlantic area, can we even in fancy place a limit on the possibilities of the Pacific?

ARBITRATION IN INDUSTRIAL AFFAIRS.

One of the greatest authorities in industrial affairs is Charles Francis Adams. In the light of the present struggle between the United States Steel Corporation and the Amalgamated Association, a recent contribution to the *Evening Post*, New York, is of interest:

As it is always the case when some pitched battle between consolidated capital and organized labor is plainly impending, much is now being written and said on the subject of arbitration—or "compulsory arbitration," whatever that may be—as a means of putting a stop to these conflicts, or at least of mitigating the injury and inconvenience they occasion. As between the employer and the employed it is, of course, a matter of secondary consideration. Were no one else concerned, they might safely be left to face, as best they might, the results of a trial of endurance. Unfortunately, in these days of well-nigh unlimited consolidation on the one side and almost complete organization on the other, the general public—the community at large—necessarily sustains prejudice. It is, also, defenceless—without apparent power to intervene for its own protection. As to what is known as "compulsory arbitration," no practical method of causing the award of any tribunal to be respected and obeyed has yet been devised, and it is difficult to see how one can be devised. It is obviously impossible by any provision of law or decree of equity to compel a man to carry on a business which he is not willing to carry on; and, on the other hand, it is equally impossible to force any employee to labor, if he prefers to be idle. Even "government by injunction" will not go that length.

My object is to call attention at this juncture to the nearest approach to a practical solution of this problem which, so far as my observation goes, has yet been devised and put in use. In the state of Massachusetts there is, and for thirty years has been, a board of railroad commissioners. In the history of that board there is one important but now forgotten experience from which a highly suggestive lesson can be drawn. It occurred nearly twenty-five years ago; and, now that the United States Steel Corporation and the Amalgamated Association are at issue, it might be well worth while to revive a recollection of that experience. The Massachusetts railroad commission was organized in 1869 on the theory that, in adjusting matters of difference between the community and its railroad corporations, arbitrary power was, in the long run, less effective in producing results than investigation and subsequent well-considered recommendations based thereon. In the event of differences between corporations and their employees, even when resulting in strikes and "tie-ups," the commissioners had no special powers. It was merely their duty in a general way to take official cognizance of the fact that the community was sustaining an injury or an inconvenience, and to investigate the cause thereof. Having so investigated the board was empowered to locate the responsibility for such injury or inconvenience, and make its recommendations accordingly. But those recommendations had a moral force merely. They could be addressed to the parties concerned and to public opinion only. Their effect, greater or less, was measured by the justice and good sense impressed upon them.

At 4 o'clock p. m. of Feb. 12, 1877, all the locomotive engineers and firemen in the employ of the Boston & Maine Railroad Co. stopped work in a body, abandoning their trains. The strike was not altogether unexpected; but, of necessity, the operation of the road was seriously interfered with. The commissioners did not at first intervene, neither party calling upon them. Both were, indeed, unwilling so to do, being apprehensive, apparently, of some action adverse to their interests. When several days of interrupted traffic had elapsed, the board concluded that it was time to recognize the fact that the public was suffering inconvenience; for the Boston & Maine railroad then was, as it now is, one of the principal arteries of eastern New England. Both the directors of the company and the employees of the Brotherhood of Locomotive Engineers were accordingly notified that the board proposed to take a hand in the matter, which it at once proceeded to do, notifying an investigation. Both parties appeared—without confessing itself in the wrong, neither could well help so doing—and professed willingness to submit their cases. No suggestion of a readiness to abide by a decision thereon was asked for or given. The board then proceeded to hear witnesses and to ascertain the facts. The inquiry was continued through three days, and on Feb. 21 the report of the board was made public, appearing in full in all the papers. In it the board, after carefully and judicially stating the facts of the case, placed the responsibility for the trouble where the weight of evidence showed it belonged, and made such recommendations as in its judgment the occasion called for. The effect was immediate. An authentic record was before the community, and public opinion, crystallizing at once, made itself felt. Into the history and merits of that particular struggle it is unnecessary to enter. The present object is merely to call attention to what was then done, and done successfully, as constituting the nearest practical approach possible to what is called "compulsory" arbitration. A public board is provided; that board takes cognizance of what is notorious, and when either the peace or the business of the community sustains prejudice, or is gravely jeopardized, it becomes its duty to intervene officially. It then spreads the facts before the community and makes its recommendation. There it stops, for it can compel obedience on neither side. Setting forth the facts, its appeal is to an enlightened public opinion. So stimulated, public opinion rarely fails to make itself felt. It did so in the case referred to. The atmosphere cleared at once, and no further action was found necessary.

Were such a machinery as this in existence, either national or provided by the state of Pennsylvania—were the executive empowered pro hac vice to appoint such a board—it would seem more than probable that a practical solution of the difficulty now impending could easily be reached. The community has already sustained grave prejudice. By a continuance of the existing conditions, not only must private interests be sacrificed, but the public peace will be endangered. It is not probable that either party would call upon such a board to intervene. Both would look at it askance. It would rest in its discretion, or that of the executive, to decide whether the case was one which justified a public initiative. Should it be decided that the circumstances did call for it, the board would give notice to all concerned that, at the proper time and place, it proposed to enter upon an investigation. If both, or either, of the parties saw fit then to appear and submit the facts, those facts would become public property. Did one party appear, the other would absent itself at its peril. Should neither party appear, producing authentic documents and putting in a

case, the board would proceed to enlighten itself through all other accessible means. If unable to summon witnesses or enforce the production of documents, it would still have open many secondary channels of information. To all such it would have recourse. Having done so, it would make its report, putting the responsibility where the facts accessible showed it belonged, and recommending such practical solution of the trouble as might commend itself to the judgment of an unprejudiced tribunal. The report so made would carry with the public and the parties concerned exactly that degree of weight its judicial character and reasoning might impart to it. It could not be enforced by any governmental process. There is no sheriff behind it. But, if well reasoned and fair, it would represent the moral weight of an aroused and advised public opinion. This is, for every practical end, "compulsory" arbitration.

Did some such machinery exist, and could such an investigation be made, there is reason to believe that a timely report now submitted would, in the present case, afford to one or both parties concerned an opportunity to withdraw creditably from their position both false and perilous. Were the facts undisputed or clearly proven, and the recommendations made thereon judicious and reasonable, it would at least remove from the path the impediment of false pride—that fatal stumbling block in the case of nine strikes out of ten. An opportunity gracefully to recede would be offered. This done, should either party persist, the responsibility for obstinate persistence would be placed. Experience shows that public opinion could then be relied on to enforce process. It was so in Massachusetts in the case of the strike of 1877. The result on that occasion was all that could be desired. There seems no sufficient reason to doubt that, if it were possible to have recourse to the same procedure now, a like practical result would ensue. Great public inconvenience and private loss might thus be averted. But, in case they were not averted, and the struggle went on, no additional harm would have been done. Merely investigation and public opinion would have been brought into play, in this case fruitlessly. That, surely, prejudices nothing and no one.

FOREIGN SHIP BUILDING NOTES.

Messrs. Sir W. G. Armstrong, Whitworth & Co., Ltd., have built a large ferry steamer named the *Scotia* for the carriage of railway trains across the Straits of Canso to and from Port Musgrave, Nova Scotia. This steamer, which has been built to the order of the Canadian minister of railways and canals, is also arranged as an ice crusher, as during a considerable portion of the winter the Straits of Canso become congested with large masses of ice. The steamer is capable of taking over a load of nine Pullman cars, each 84 ft. 6 in. long, or a correspondingly larger number of box wood cars. She is also specially strengthened to take over an express locomotive and tender weighing not less than 116 tons. The vessel has been fitted with two sets of triple expansion engines of 1,200 H. P. each.

The shallow-draught twin-screw gunboat *Moorhen*, which was launched recently from the yard of Messrs. Yarrow & Co., Ltd., Poplar, went through her official trials last week. The guaranteed speed of 13 knots was maintained for three hours with open stokehold and without the necessity of forced draft, and during one hour wood fuel alone was used. The speed trial was made en route to Sheerness, and for more than two-thirds of the trial she steamed against a 25-knot wind. On arrival at Sheerness the guns were placed on board, and she then proceeded to sea again to carry out the gun trials. The draught of the vessel was 2 ft. 3 in., with a load of forty tons on board. This vessel is built in floatable sections, and she will now be immediately disconnected for shipment abroad.

The steamship *Soestdyk*, built by Messrs. Furness, Withy & Co., Hartlepool, to the order of the Holland-American line, Rotterdam, had her trial trip last week. The vessel is 413 ft. in length, has a measurement capacity of about 13,000 tons, and takes Lloyd's highest class. She is of the three-deck type with complete shelter deck specially strengthened with all deck erections of steel and iron. Cellular double-bottom is fitted all fore-and-aft for water ballast, one forward of the engine room and one aft of it. The trial trip was satisfactory.

That the owners of the *King Edward* are satisfied with the behavior of that steamer is evidenced by the fact that Messrs. Wm. Denny & Bros., Dumbarton, Scotland, have received an order for another turbine steamer of even larger dimensions.

HAVERFORD'S MAIDEN VOYAGE.

The new American line steamship *Haverford* has just started on her maiden trip from Southampton. She is the first of a new fleet of ships designed more for their carrying capacity than for speed. The *Haverford* is a twin-screw vessel of 10,000 tons. She is 530 ft. in length and 59 ft. beam. Only one class of cabin passengers and third-class passengers will be carried on her. The accommodation for cabin passengers is located in a deck house amidships on the promenade and saloon decks, where the motion is least perceptible. On the promenade deck there is a large ladies' room, upholstered in the best style and fitted with tables and easy chairs. The smoking room is also on the promenade deck, and also a large and well-lighted library, with well stocked book cases and convenient writing tables. The dining saloon, which is on the saloon and state room deck, immediately below the promenade deck, has seats for 112 passengers. The accommodation for third-class passengers is on the upper deck and is designed to give this numerous class of passengers the greatest amount of comfort. There are a large number of small rooms for married couples and families. There is also a large smoking room for third-class passengers located on the saloon deck.

A circular just issued by Mr. W. C. Farrington, general manager of the Northern Steamship Co., announces that the office of superintending engineer of that company having been abolished, Mr. J. H. Torney has been appointed marine superintendent with headquarters at Buffalo.

It was erroneously stated in the Review last week that the *Comanche* of the Clyde line was lengthened in the dry dock of the Neafie & Levy Ship & Engine Building Co., Philadelphia. The work was done in Cramps' dry dock.

DEVELOPMENT OF MICHIGAN.

HON. PETER WHITE TRACES THE HISTORY OF THE GREAT MINERAL STATE—ITS WONDERFULLY PICTURESQUE CAREER AMONG THE STATES.

The Hon. Peter White of Marquette, of whom the Review will shortly have the pleasure of publishing an extended biography, having special relation to his connection with the development of the upper peninsula of Michigan, delivered an address lately at the centennial of Detroit upon the "Influences in the Development and Progress of Michigan." He said:

The Michigan of today is the same country the savages possessed and the French explored, and the Detroit is the same beautiful river. But how immense have been the changes! If De la Mothe Cadillac were here today he would recognize nothing but the green water of the river, and some of the names still represented in this audience. The wilderness of forest and swamp has disappeared. We could paraphrase our state motto and say to him "If you seek a beautiful and populous state look about you." Cadillac's first Michigan experience was not at Detroit. Mackinac, or Michilimackinac was the great post for French influence. But the site of Teuscha Grondie, the Indian village that used to stand here, had been recognized as of immense strategic importance as a check on the plans of the English and their wily hirelings, the Iroquois, so Cadillac was duly commissioned to establish a fort here. The early French influence is hard to characterize in any simple terms. It was religious and every unprejudiced observer must agree with Parkman, Hubbard, Trowbridge and Campbell, that it was sincerely so. The Recollet or Franciscan missionaries came first, but seemed to lack the stamina of their successors, the Jesuits, and these from long association with soldiers and politicians learned to look on the country with one eye for the church and another for the interests of La Belle France. Great as was the political significance of the Jesuit explorations, it would be hard to trace anything modern back to them. They were for a long time lost sight of, and indeed the religious effect was also for a long time supposed to be lost. But when the resettlement of Northern Michigan began in 1830, or thereabouts, and Roman Catholic missionaries once more came in contact with the Indians, they found unmistakable evidences of their earlier christianization, and that, without priest or altar, they had retained some knowledge of the faith once taught them. With the priest, or sometimes alone, came the soldier, oftentimes a gentleman or small nobleman. Some of the priests—Marquette, Hennepin, Mesnard, Allouez, Dablon, Jogues—were as great heroes as ever fell on the battlefield, but their soldier companions, like Joliet, Du Lhut, Cadillac and LaSalle, seem to have been worthy of them. Their exploits were simply marvelous, and it would have been well for this universal Yankee nation could she have borrowed from the French their invariable fairness toward the Indians and almost unailing success in finally conciliating their friendship.

With each settlement came necessarily a fort, a small garrison and a motley crew of voyageurs, coureurs de bois, and serviteurs, ready to follow the settlement to a new place if it was transferred. The garrison would protect merchants and skilled mechanics and grants would be made, as they were here, under peculiar conditions to settlers on the shore. Every original French settlement was on a water course. The original carry-all was a bateau or canoe.

The settlement on the Detroit was fluctuating as to population. In 1763 it had about 2,500 people in the fort and scattered in the cottages along the river. Anyone who now goes down to Petite Cote can get a fair idea of the way the original cottages stood, only then there were no roads and barely any clearings. But now and again a new settlement in the Illinois country would take away half the population, and there was no substantial growth. The early habitant was a poor farmer. I suspect that farming in Normandy must have been at that time very backward, and for a long time the river Frenchman did not improve. He threw away his fertilizers and ploughed very lightly. But he had good taste in apples and pears. The snow apple, wherever he got it, comes direct from the along-the-river Frenchman. It is certainly a great civilizer. The so-called French pear is seen nowhere else.

The backwardness of the French farmer may be attributed partly to the restrictions, feudal in their character, under which they held their land; partly also to the speedy admixture of Indian blood, bred to the chase among the settlers. But this admixture seems not to have affected the town or garrison people to any considerable extent. They retain their pure Caucasian lineage most honorably until this day. Gay and careless in some ways as the early French were, they were not lax in morals, as some writers have stated. They were devoted church goers and loyal friends, and were not left wholly without education. Even among the women reading was not uncommon. In the revolution and in 1812 the French became strong American partisans. They never took kindly to British rule. In business they were honorable but extremely conservative; in hospitality supreme. So charming were the convent-bred belles of the better class among them that future settlers of every sort who came here found them wives among the French, so that it is hardly necessary to prove more than the very early settlement of any particular family in Detroit to raise a strong presumption of French blood, whatever the name may be.

The one trade the early Frenchman cared for was the fur trade. The English and Americans who came after 1760 do not seem to have looked beyond this. The English had to suppress Pontiac before they could do much, and the revolution followed too soon for British influence to have pressed very deep. Many personal friends of Mr. C. C. Trowbridge are here assembled. There were 9,000 people in Michigan when he came, and he personally talked with many people who had seen the Bloody Run fight in 1763. Among the British commanders a most honorable place must be yielded to Major Arent De Peyster. But, in general, British military occupancy merely meant that Detroit was an emporium for rum, tomahawks and gun powder, and Hamilton in the revolution and Proctor in the war of 1812 have dishonorable prominence in purchasing or permitting savage barbarity.

The surrender of the northwest posts in 1796 brought in the first considerable number of English-speaking residents. They were of a somewhat different character from the earlier stock, because coming with broader prospects they came mainly from Ohio and belonged to genuine American stock. The territorial government came in immediately after

the fire which destroyed old Detroit in 1805, and brought an additional settlement, but until after 1815 there was nothing considerable at any distance from the old French posts. Four thousand people in 1805 had increased to 9,000 and this in a territory more than twice as large as the present limits include. After 1812 an increasing number of settlers began to come in from New York, so that whole rural neighborhoods now bear the names of those sections, and when the state was organized the laws of New York and its legal practice formed models for very slightly-modified adoption.

Since state organization the growth in wealth and population has greatly advanced, and here and there large sections have been entirely taken up by foreign colonies. But foreign-born populations have had far less to do, save in the north, with developing our state than with many western states. The voyageurs hung on in the north around Mackinac as long as that post remained the headquarters of the American Fur Co., and there are many people still living who are familiar with everything about old wood ranger and voyageur life.

At the risk of being considered tedious, I feel that I must give you a little idea of the life of the wood ranger and voyageur from a bit of my own experience. On April 9, 1851, Hon. Abner Sherman arrived at Marquette from Ontonagon, on foot and alone. He was enroute for Sault Ste. Marie by the same kind of conveyance. The agent of the Marquette Iron Co., in whose employ I was, looked upon it as a delightful opportunity for the young clerk in the company store to journey with Mr. Sherman from Marquette to Sault Ste. Marie, in order that a new tract of land might be secured before other parties might purchase it at the United States land office at that place. We were to make our way through an unbroken wilderness, through a trackless forest and unknown swamps, along a lake shore with but little beach, the lake still full of broken ice, the woods still full of snow in drifts many feet deep, the rivers everywhere overflowing their banks and rushing in raging torrents down to the lake. There was little show of "April showers bringing forth May flowers." We each carried two blankets, some extra clothing, a tin pail in which to make tea, and each carried provisions estimated to last eight days. Each had a pair of large snow shoes and one carried what we called a half axe. Each had in his pack at least forty pounds. No Indian or half breed or French voyageur possessed greater powers of endurance than did this brace of woodsmen, or statesmen, whichever you might style them. Starting from Marquette at 10 a. m. April 9, we crossed many swollen streams on improvised rafts and at 6 o'clock at night we reached the Au Train river. It seemed 1,000 ft. wide. We hastily constructed a wide raft of dry cedar logs that lay scattered along the shore. We noticed that these logs were old timbers, as they were perforated with worm-holes, yet we believed the craft would carry us safely over. We did not know then, as I have since become convinced, that the worm-holes in those cedar logs were loaded with sand and that as soon as they should be loaded with water they would sink to the bottom as quickly as bars of iron. We jumped upon our raft, armed with poles to propel it, I retaining my pack upon my back, with the ten-quart tin pail, its cover tightly closed, and this fact enables me to be here today to tell you the story, for with the very rapid current we had necessarily to cross the downward way diagonally, and when we reached the middle of the river the water-logged raft went down as quickly as if 100 tons of rock had fallen on it. Mr. Sherman, a powerful swimmer, reached the other shore, not without almost superhuman efforts, and I with my life preserver pail holding my head above the water passed down out of the mouth of the river until my feet struck the sand bar, where I guided myself towards shore, my comrade coming out and extending me a helping hand, say 100 or 200 ft. from shore. Ten minutes before I had not the slightest chance ever to reach shore alive. Sherman remarked that he was mighty glad that I had saved the pail. We made a big fire and dried our clothes and slept well that night, for we were tired. The next day we reached a point opposite Grand island. In that harbor there was no ice. We built a fire and made other signals that induced Williams, the king of Grand island, to send over a fish boat for us. We remained with him over night and he sold us an old boat, sails and oars, with which we got on our way about fifteen miles when we encountered vast fields of ice, impenetrable though much broken up. So after securing the boat where some one might some day find it, we trudged on, sometimes through deep sand, then slushy snow, then through terrible swamps—sometimes when night came finding no place dry enough to enable us to build a fire. We would travel on and on until darkness forbade another step, then the balance of the sleepless night was terrible and we would take advantage of the first dry spot next day to make a fire and take a short nap. I will not further tire you with the dull details of our trip, except to say that after fording or rafting across many rivers and surviving many other perils, we reached Tauquamenon bay, where we could not walk on the beach as there was no beach. We could not walk in the woods on account of deep water, and brush and logs so thick as to make it impossible with packs on our backs to make any headway. So we had to take to the water, which was full of slush ice, but we got along slowly in it, and after nine days of excitement, peril and suffering, foot-sore and weary, we reached Sault Ste. Marie. I waited for weeks to get a steamer to get back home. I have never tried that trip since. I forgot to tell you that my companion carried a pistol, and his unerring aim several times brought down a fat partridge, otherwise we might have starved.

The interior of Michigan was so long supposed to be a wilderness that none of the revolutionary land warrants were taken up here. There military lands long retarded actual settlement in other states, but not so much in Michigan. The actual settler soon became of the opinion of Bishop Philander Chase, who lived for some time at Gilead in Branch county, that no fairer land could be found anywhere. The early settlers of American stock were deeply concerned about education, and Catholic and Protestant joined hands in the erection of the university. There was thus an early growth of enlightened public sentiment, but Judge Campbell points out that the whipping post for Indians and negroes convicted of various offenses and for disorderly persons was still maintained as late as 1831, and could be used by order of a single justice. "The not-less-barbarous custom of selling the poor to the lowest bidder," he adds "was also long kept up, with the disgusting spectacle of the ball and chain gang."

I cannot refrain from quoting entire another paragraph from Judge Campbell's wonderful book. Writing in the national centennial year he

said: "This year, of so much interest to the people of the United States, finds Michigan furnishing a hopeful illustration of the results of the experiment made a hundred years ago. She was then governed by martial law, with few people and but one civil settlement. For twenty years after the declaration of independence, she remained under British control, and was intended to be reserved as a refuge for savages and a haunt of beasts of the chase. A few years later she fell again for a short time under the same governance, as much to the surprise of the captors as to the disgust and rage of the surrendered. But with the recapture came the beginning of progress. Multitudes of the revolutionary patriots and of their children came westward to enjoy the inheritance earned by the struggle for independence. The laws and customs of the new land were fresh copies of those of the older colonies, changed only where change was needed. In every village churches and schools stood foremost in the estimation of the people, and ignorance, idleness and immorality were under the ban."

So much for general influences. "The men who had most to do with them must not be forgotten. Chief and foremost is the name of Cass, and with him many other of national and worldwide renown. While receiving influences on her development, Michigan has not been slow to assert herself upon others. The University of Michigan is the pioneer of much of the modern system of American education. The Michigan supreme court under the immortal quartet, Campbell, Cooley, Christy and Graves, continues and will continue to be quoted with respect, admiration and authority throughout the English-speaking world. We have not selfishly absorbed, but have given to the world even more than we have received. It is well to listen to the wise man when he says "Let us now praise honest men." Where else do we need to turn? We have had statesmen in Cass, Lothrop, Dickinson and McClelland; senators in Felch, Norvall, Howard and Chandler; judges in the noble quartet I have mentioned; merchant princes, manufacturers, civic reformers, advocates, authors, educators, poets, artists, scientists, explorers, ethnologists, financiers, diplomats; whole-souled gentlemen, Christian prelates, and devoted missionaries; kings of men, as noble as the noblest, like the Trowbridge you all know. We have had orators, too, and we have them still.

May I in conclusion say something about the Detroit of my first acquaintance, and recall a few of the events and circumstances of the times? I came here first in the early summer of 1845 in search of employment which I did not find. But I had better luck the next year, and worked for Freeman & Bro., who kept a grocery store on the corner of Brush street and Jefferson avenue. I spent portions of '45, '46 and '47 in your beautiful city. It was then as beautiful as now. Many streets were not paved, and were sandy and sometimes very muddy. It seems to me now that down through the middle of Jefferson avenue was a plank road and that in the autumn and winter months the mud on each side of it used to be hub deep, and that portion of the avenue between Bates and Brush streets was the market place of the city, where stood loads of wood, hay and potatoes every day in the year, except Sundays and holidays. Garry Spencer, justice of the peace, before whom all infractions of city ordinances were tried, had his office on the upper side of the avenue near this market place, and not infrequently a boisterous mob stood about his office door on the sidewalk, eager to learn for how many days or dollars the sentences were. I think there were four good banks then in the city—the Michigan Insurance Company bank, the Peninsular, the Farmers & Mechanics, and the State bank. They were all good always, and when they quit they did it honorably. There is much to write about the banks and brokers of Michigan in early days that would be entertaining, but far too voluminous for this occasion. There was a plague here in those early days known as fever and ague, that came in April and remained until December, leaving seeds for the next year's crop. Seventy-five per cent. of the people of all ages had it each year, and they shook at regular and irregular hours every other day. When the apples and peaches were ripe one of these shakers could grasp the trunk of a tree and before he was through shaking all the fruit would be harvested.

More than half a century has passed since my first visit to Detroit, and every one of its years has brought to Detroit some improvement, and developed its industries, its beauty and its natural charm. Detroit citizens may take just pride in their city, for all Michigan is proud of it, and in a peculiar way it belongs to all Michigan, for it has been the key of the state's development and progress. No boat ever plies the great lakes but some eye views admiringly the City of the Straits and its beautiful park. No stranger ever visited it without giving it its desired tribute of praise, and no traveller returning to it as his home but has noticed with eyes grown keener-sighted by wider observation, how richly nature has endowed Detroit and how ably and wisely its people have builded and adorned it. And it seems most fitting that the people of Detroit should celebrate today two hundred years of progress and should give their meed of praise to those men who, by their bravery, their wisdom and their energy, have brought the city to its fair perfection, and going back over the long list, that they should delight to dwell on its romantic beginnings and picture to themselves a July day two hundred years ago when that brave soldier of France, Cadillac, building better than he knew, laid the foundation of the most beautiful city of the west. Cadillac, with a keen eye to its commercial importance, distinguished it as "the porte ouvre on this continent through which the king might go in and out to trade with his allies." To none of these explorers did the future seem so hidden as to those who landed upon the banks of the Detroit river on July 25, 1701.

A Pittsburg dispatch says that the Pittsburg Seamless Tube Co. has asked for a state charter and will enter the commercial field in competition with the National Tube Co. It is proposed to acquire the plant, patents, etc., of the old Atlantic Tube Co. at Beaver, Pa., which will be sold under foreclosure next month. The Atlantic bondholders will, it is said, accept the paper of the new concern. The Atlantic has run down and has been doing little for some time. Now that the Shelby company has been absorbed by the United States Steel Corporation, the Pittsburg promoters believe that a strong independent concern can succeed. The capital will be about \$1,000,000.

Work on the five-masted schooner, now building for the Sutton fleet of New Haven, Mass., at the West Mystic yard of the Holmes Ship Building Co. is progressing rapidly.

GROWTH OF TRADE WITH MEXICO.

The rapid growth of the trade of the United States with Mexico is illustrated by the following statement by the British consul in Mexico, a copy of which has just reached the treasury bureau of statistics:

"It is very interesting to note the fluctuations in the proportion that each of the principal countries represents in the total import trade of Mexico. According to returns already published, it is seen that in the year 1873 the United Kingdom's share in this trade represented a very much larger proportion, but with the advance of the railways this proportion has decreased very materially. On the other hand, the proportion of merchandise imported from or through the United States has advanced very considerably. In the fiscal year 1872-3 its value represented 26 per cent. of the total, while in the year ended Dec. 31, 1900, this proportion had risen to 51 per cent. The value of the imports from the United Kingdom and her colonies in the calendar year 1900 was £2,217,111, as against £2,072,103 in 1899, which, though greater in value, shows a proportion of only 17 per cent. as against 18½ per cent. in 1899. The value of the imports from her colonies shows that India sent over £76,000, and Australia £6,720, while Canada shows but a value of £1,640. Although these figures, if compared with the statistics published by the government of the dominion, would show a difference, it must be borne in mind that as all the imports from Canada have to pass through the United States (there being no direct maritime service from Canada to Mexico), in the Mexican returns it is more than probable that they are entered as being of American production.

"The imports from the United States of America represent a value of £6,767,042, as against £5,502,041 in 1899, showing an increase of 23 per cent. over those of last year, and an advance from 48¾ to 51½ per cent. of the total value of the imports. The value of the imports from France in 1900 was £1,383,869, as against £1,294,922 in 1899, which shows a still further decrease in the proportion they bear to the total value of the imports. In 1899 their value represented 11½ per cent., while in the present year the proportion is only 10½ per cent. An increase of £253,467, or nearly 21 per cent., is visible in the value of the imports from Germany during the present year. The value is respectively £1,222,784 in 1899 and £1,476,630 in 1900; but notwithstanding this advance in value, its proportion to the total is but 11½ per cent., as compared with 10¾ per cent. in 1899.

"Spain's proportion of the trade of Mexico fluctuates between 4 and 5½ per cent. in each year. In 1899 the value of Spanish merchandise imported into this country was £609,209, representing 5½ per cent. of the total value of the imports; while in the year 1900 the value was £596,196, and represents a proportion of but 4½ per cent. Other countries, principally European nations (in the following order: Belgium, Italy, Austria-Hungary, Switzerland and Holland) make up the greater portion of the value of the imports under this head, which show a value of £653,632, as against £553,256 in 1899. This increase, however, does not increase its proportion of 5 per cent. to the total value of the imports.

"The total value from the whole of Central and South America and the West Indies (Cuba) in the year 1900 was only £108,194, or scarcely more than the value of the merchandise imported from Italy alone (£103,198). This is the more noticeable, as on account of their proximity to this country, one would suppose that a readier market could be found here for the produce of these countries, but the means of communication are difficult, most of the countries having to send either to New York, Jamaica, and even the United Kingdom, in order to find a means of conveying their merchandise to Mexico. In the case of the imports the connections can be made, but in order to send produce or merchandise from here to the Southern American republics on the Atlantic seaboard, it is, one may say, imperative to send them to New York or the United Kingdom, as the only means of sending them otherwise is by the Spanish line, which sometimes touches at ports in the West Indies."

GROWTH OF SEA-GOING LIGHTERAGE TRADE.

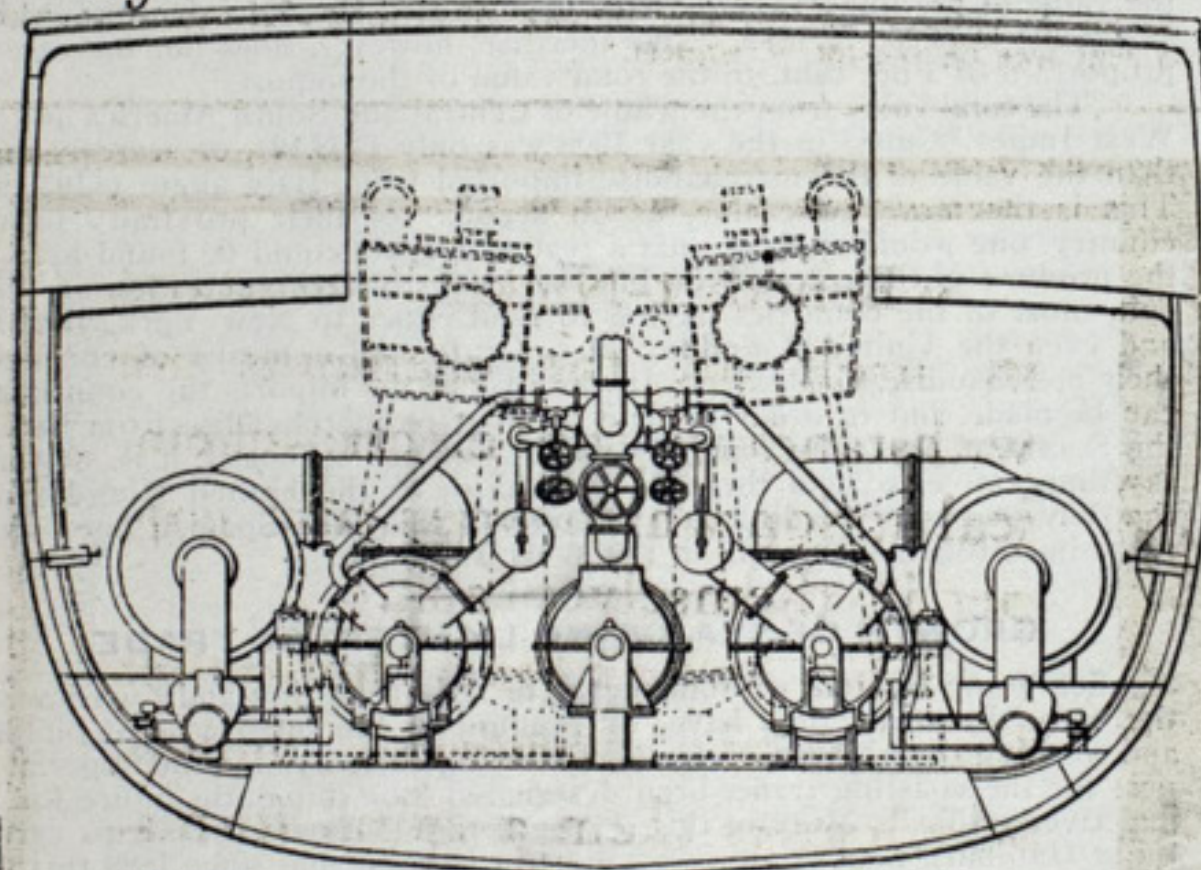
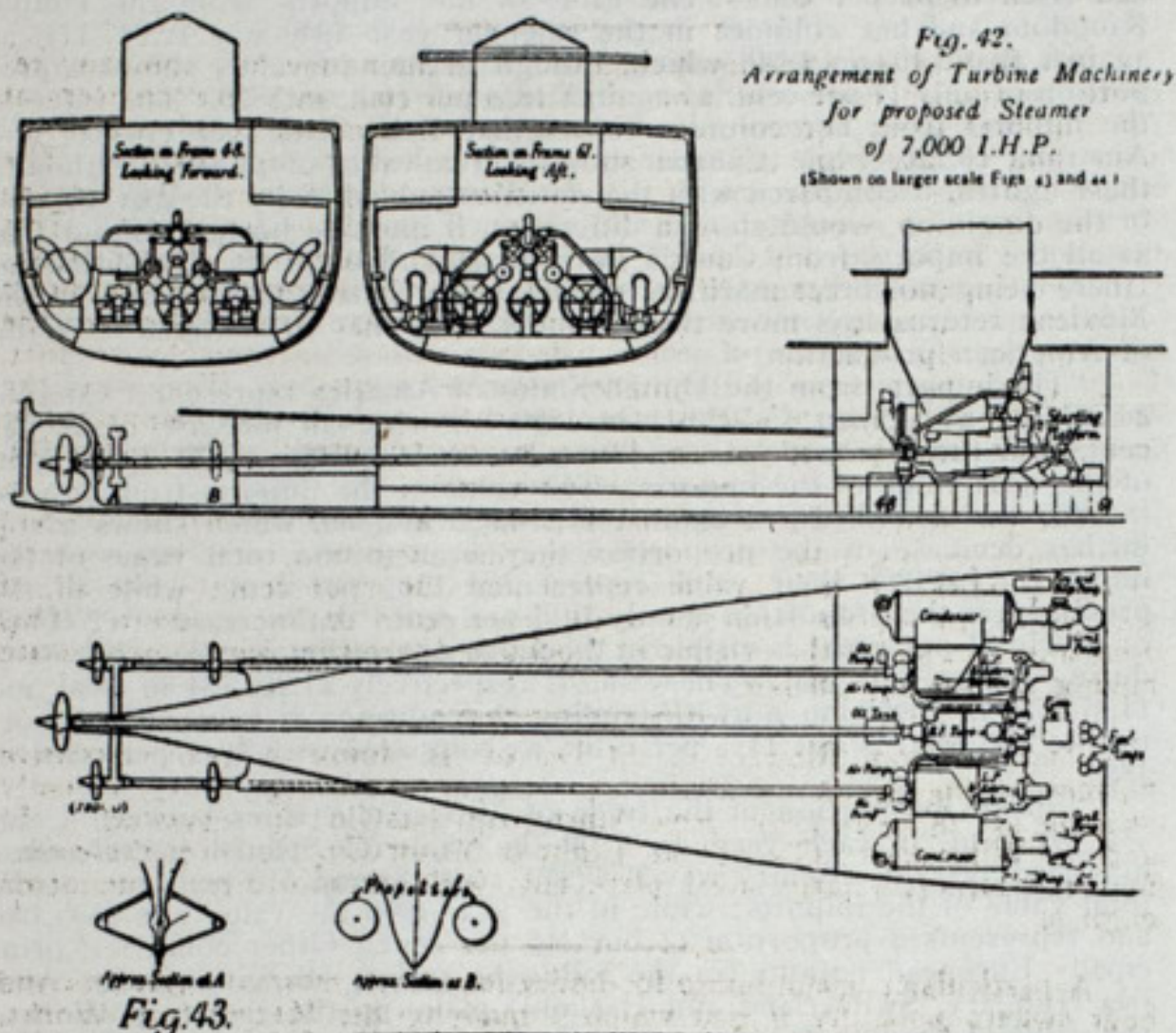
Sea-going lighters without means of self-propulsion and towed across the ocean by steam tugs have, on account of the small cost of building and working them, their large cargo-carrying capacity, and their special fitness for the coasting trade, been designated "the ship of the future for sea and river traffic." More of this sea-lighterage business is perhaps carried on at Hamburg than at any other port in Europe, and since 1899 this particular branch of trade is treated separately in the shipping statistics of Hamburg, the resulting figures showing that the ocean lighter, whether it is to be the ship of the future or not, is being brought into abundant use at present. During 1900 the number of lighters which entered the port of Hamburg was 1,135, measuring altogether 294,787 register tons (or 260 tons on the average), and manned by 3,860 persons (or three to four men on the average), while for 1899 the figures were 1,136 lighters, 286,586 tons, and 3,735 men. Lighters of larger tonnage, therefore, were brought into use last year. In the adjacent harbor of Altona five lighters arrived, with a total measurement of 1,893 tons. The greater part of this lighter-traffic is carried on with German ports around the coast. Not a single lighter arrived from any port outside of Europe, notwithstanding that in America—where large lighters have long been in use on the great lakes and along the coast—an overseas lighter-traffic is not regarded as an impossibility. From non-German ports fifty-four lighters, measuring 15,775 tons, arrived at Hamburg, of which number forty (9,154 tons) went from Denmark, six (2,304 tons) from Holland, five (3,190 tons) from England, and three (1,127 tons) from Sweden. As regards the traffic with other German ports, a large proportion of it is connected with the port of Bremen, from which place 787 lighters, measuring 206,627 tons, arrived at Hamburg. From Hanover 150 lighters arrived, from Oldenburg seventy-three, from Schleswig-Holstein (the lower Elbe) forty-three, from the Baltic fourteen, from East Prussia one, from Pomerania four, from Mecklenburg five, and from Cuxhaven four. The share which Hamburg ship owners will take in the increasing maritime trade of Emden will probably lead to an active goods traffic between those ports and give a fresh impetus to the sea-going lighterage business.—Fairplay, London.

A British admiralty chart, Midland section of Georgian bay, will be sent, postpaid, to any address for \$1.25; regular price \$1.75. Size of sheet 3x4 ft. The Marine Review Pub. Co., Perry-Payne building, Cleveland. Chart of the whole bay on one sheet at the same price.

PROGRESS IN MARINE ENGINEERING.

GREAT STRIDES HAVE BEEN MADE DURING THE PAST TEN YEARS—POWER REQUIRED A FEW YEARS AGO COMPARED WITH WHAT IS NOW NECESSARY.

A brief reference has already been made in the Review to Mr. James McKechnie's address upon the "Progress of Marine Engineering During the last Ten Years." We are now enabled to give the summary of his conclusions, together with his reference to the latest development in marine engineering—the steam turbine. The most notable progress during the past ten years has been in the direction of speed. In 1891 there



COMPARISON BETWEEN THE PARSONS TURBINE (Fig. 42) AND RECIPROCATING ENGINES OF 7000 H.P.

were only eight vessels whose speed exceeded 20 knots. Now there are fifty-eight. The vessels between 19 and 19½ knots' speed have doubled numbering now thirty-four. Great Britain holds a high position relatively owing to its number of swift channel steamers. The highest speed attained ten years ago was 25 knots, recorded for a British-built Brazilian torpedo boat, the fastest British navy torpedo boat being 22½ knots. The record for speed now is held by the Viper, lately destroyed, with a maximum of 37.113 knots and a mean for one hour of 36.581 knots. The highest ocean speed ten years ago was 20.7 knots by the Paris and New York. Today the highest speed on an ocean run has been attained by the Deutschland, which has maintained an average of 23.51 knots, while the best speed got with channel steamers is 23.62 knots.

It is interesting also to compare the weights of machinery with those of ten and twenty years ago. In 1881 the average for merchant ships was recorded as 4.66 I.H.P. per ton, while in 1891 the average for cargo boats was 4.8 and is now about the same. For the fastest liner the weight ten years ago was also about the same as it is now, 6.7 I.H.P. per ton, but generally there is now more boiler power and additional weight in the machinery. In naval practice there has been a marked diminution in weight, the rate in 1881 being 6¼ I.H.P. per ton of machinery and in 1891 10 I. H. P. per ton, and now 12 I. H. P. all for natural draft.

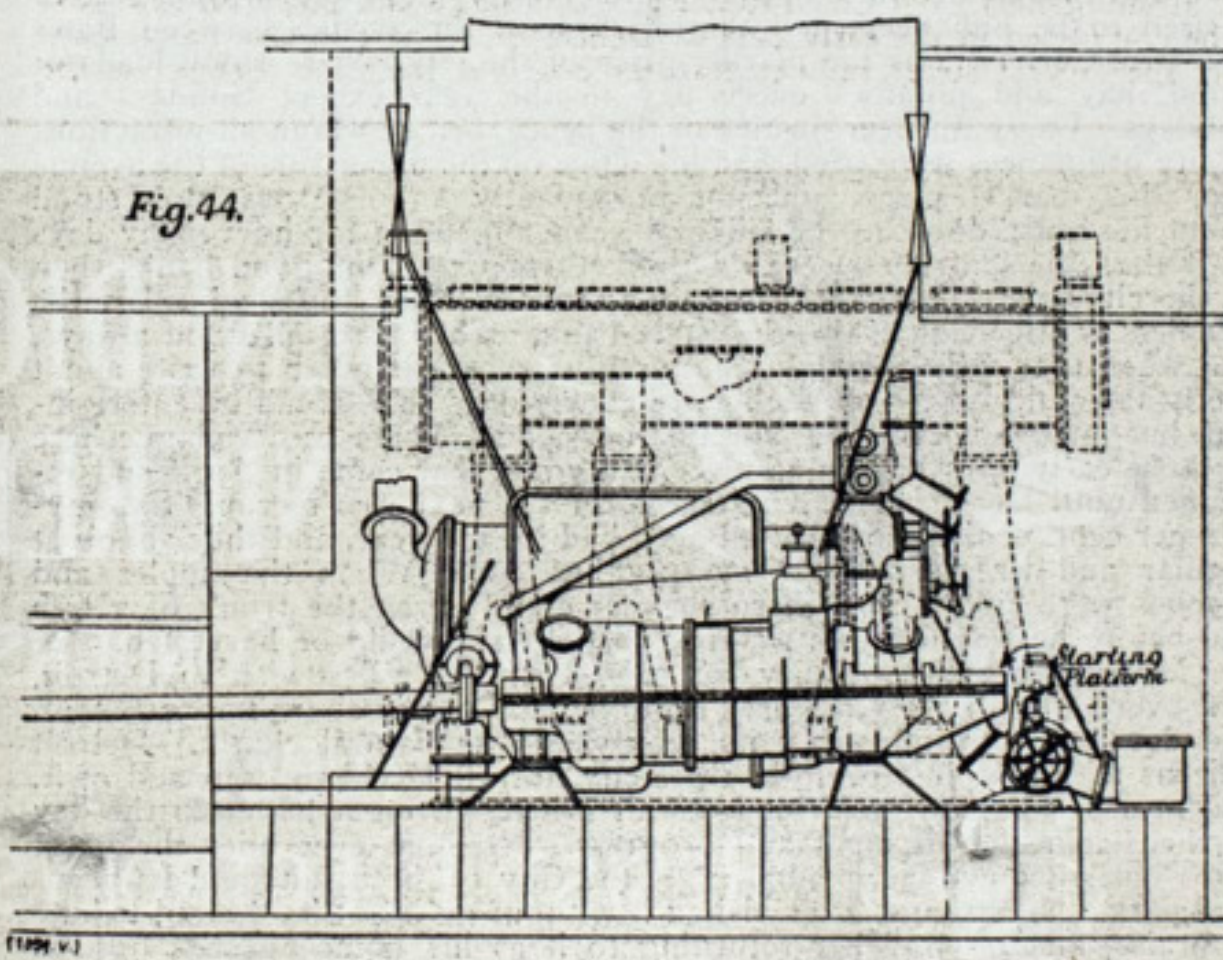
Any review of marine engineering progress would be incomplete without a reference to the possibilities of propulsion by steam turbines. In electric-light work the steam turbine has become a most efficient motor, and exhaustive trials have demonstrated its economy in steam consumption, the actual rate of a 1,000 kilowatt set having been 9.19 kilogrammes per kilowatt-hour, which may be accepted as equalling about 12½ lbs. per H.P. hour. In the case of a long-distance sea voyage at a uniform speed—and this is the condition prevailing in 99 per cent. of merchant steamers—there can be no doubt of the economy of the turbine.

In such case it can be designed for the maximum load, which would be the average working load. For naval work, where the speed is variable, the same advantage may not accrue, because the steam losses are practically constant irrespective of the power being developed. Where weight is a primary factor, even this need not militate against its adoption, and thus it would seem as if the future would see a great development in this direction. Fig. 42 illustrates the design for a Parsons turbine-driven steamer of 7,000 H.P. with three shafts, two of which are driven by low-pressure turbines, while the center shaft motor is of the high-pressure type. The turbines for driving the ship astern are incorporated with the low-pressure system, being fitted in the exhaust casings with a valve to pass the steam direct from the boiler to the astern turbines, in which case the low-pressure ahead turbines on the same shaft rotate in a vacuum. At the same time, the steam is cut off from the high-pressure turbine, which also runs idle in a vacuum. It will thus be seen that for driving ahead the steam passes through the high-pressure turbine, thence through self-closing valves to the two low-pressure turbines, and finally to the condenser; but should the order be given to reverse the engines, the main admission valve is closed, and the steam is then passed through other valves to the two astern turbines, which, being of large area, develop considerable power and speed sternwards. The self-closing valves prevent the steam passing to the high-pressure motor. The change is easily made, as all the valves are actuated from the same platform; and the arrangement is such that either or the side propellers may be driven ahead or astern separately. As to the relative space occupied, the sections (Figs. 43 and 44), show the difference at a glance, and the weight and space occupied for turbine machinery and reciprocating engines of 7,000 I. H. P. are as follow:

	Reciprocating engines.	Turbine machinery.
Weight in engine-rooms and tunnel complete..	270 tons.	190 tons.
Floor space in engine-room.....	911 sq. ft.	911 sq. ft.
Cubic capacity required by engines.....	14,430 cu. ft.	10,500 cu. ft.

The success of the Parsons turbine has brought several others into the field, and although experiments have been made at Barrow-in-Furness with several of these, they are not sufficiently advanced or conclusive to enable results to be given here. The season's work of the turbine-driven steamer King Edward, built on the Clyde, will also yield most important data.

In conclusion, the author summarizes the results attained during the ten years. Steam pressures have been increased in the merchant marine from 158 lbs. to 197 lbs. per square inch, the maximum attained being 267 lbs. per square inch, and 300 lbs. in the naval service. The piston speed of mercantile machinery has gone up from 529 to 654 ft. per minute, the



maximum in merchant practice being about 900 ft., and in naval practice 960 ft. for large engines, and 1,300 ft. in torpedo boat destroyers. Boilers also yield a greater power for a given surface, and thus the average power per ton of machinery has gone up from an average of 6 to about 7 I.H.P. per ton of machinery. The net results in respect of speed are that while ten years ago the highest sustained ocean speed was 20.7 knots, it is now 23.51 knots; the highest speed for large warships was 22 knots, and is now 23 knots on a trial of double the duration of those of ten years ago; the maximum speed attained by any craft was 25 knots, as compared with 36.581 knots now; while the number of ships of over 20 knots was eight in 1891, and is fifty-eight now. But probably the result of most importance, because affecting every type of ship from the tramp to the greyhound, is the reduction in the coal consumption. Ten years ago the rate for ocean voyages was 1.75 lbs. per H.P. per hour; today, in the most modern ships, it is about 1.5 lbs. Ten years ago 1 ton of cargo was carried 100 miles for 10 lbs. of fuel; whereas now, with the great increase in the size of ships and other mechanical improvements, the same work is done for about 4 lbs. of coal—a result which means a very great saving when applied to the immense fleet of over-sea carriers throughout the world.

The new steamship La Savoie of the Compagnie Generale Transatlantique arrived in New York on her maiden trip this week. She is a sister ship of La Lorraine, which entered the service this year. She is 580 ft. long, 60 ft. 2½ in. wide and 39 ft. 4 in. deep. She has a displacement of 15,300 tons and 22,000 H. P. La Savoie has six decks with six steam transverse and nine longitudinal water-tight bulkheads, two sets of triple expansion engines and nickel steel shafts. Her interior furnishings are elaborate. She is equipped to carry 400 saloon, 125 second-class and 1,000 steerage passengers.

SHIP BUILDING NOTES.

A perfect hive of industry is the Fore River Ship & Engine Co.'s works at Quincy, Mass. In one part of the yard the torpedo boat destroyer Lawrence is hauled out of water receiving a cleaning and otherwise being put in condition for more trial trips. She probably will steam out into the harbor in less than ten days, and the chances are that within a short time she will be speedy enough to start on the government trial. In another place the foundation is laid for the mammoth seven-masted steel schooner which is to become the property of a syndicate including Thomas W. Lawson, so it is said, and Capt. J. G. Crowley. Her keel is to be 333 ft. long. Work on the United States cruiser Des Moines has been going steadily on, until now the craft is well on the road to completion. She will be launched probably some time in November.

George H. Hitchings, Hoquiam, Wash., launched this week a four-masted wooden schooner, 166 ft. water line, 37 ft. 10 in. beam and 13 ft. 6 in. depth of hold. She is intended for the coast, Mexican and Sandwich Island trade. He has also laid the keel of another four-masted schooner 172 ft. water line, 39 ft. 6 in. beam and 14 ft. depth of hold. She will be managed by the E. K. Wood Lumber Co. of San Francisco and will be ready about March 1, 1902.

The New England Ship Building Co., Bath, Me., has contracted to build three wooden, side-wheel steamers for the Kennebec Steamboat Co. The steamers will be duplicates and of the following dimensions: Length, 275 ft.; beam, 39 ft.; depth, 14 ft. The Bath Iron Works, Bath, Me., will furnish the boilers and the W. & A. Fletcher Co., Hoboken, N. J., the engines.

A new four-masted schooner, the Sallie C. Marvil, built at Sharptown, Md., on the Nanticoke river, is the largest vessel ever built on a tributary of the Chesapeake. She is 173 ft. long, 38 ft. beam and 17 ft. depth of hold. Samuel Cooper and Thomas Saurhoof are the builders and O. V. Wooten the owner.

At Dunn & Elliott's yard, Thomaston, Me., the four-masted wooden schooner William H. Yerkes was launched last week. The official measurements are: Length, 222 ft.; breadth, 42 ft. 9 in.; depth, 19 ft. 8 in.; gross tonnage, 1,498.95; net tonnage, 1,211.33. Her masts are of Oregon pine 106 ft. in length.

A three-masted wooden schooner, the Emily I. White, building for E. I. White at Longfellow's ship yard, Machias, Me., was launched last week. Following are the vessel's dimensions: Length of keel, 122 ft.; length over all, 140 ft.; width, 33 ft. 6 in.; depth of hold, 10 ft. 7 in.; net tonnage, 296.

There is now being built by the Iowa Iron Works, Dubuque, Ia., for the Monongahela Coal Co., Pittsburg, Pa., a large and powerful tow boat to be completed in the early part of December. There is also under contract the largest street railway transfer boat yet built for service on the

Mississippi, for the Louisiana & Mississippi Transfer Co., to be completed next May, and a government light-house vessel, which, it is claimed, will be in all respects the model light-house vessel on any of the rivers of the south, to be delivered next February. The hull of the tow boat is 275 ft. long and 63 ft. wide. The engine will be of the compound type, capable of 4,800 H.P.

The Gas Engine & Power Co., and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y., will launch the torpedo boat Wilkes on Sept. 28.

Work is progressing rapidly at the yard of Cobb, Butler & Co., Rockland, Me., upon a three-masted schooner for I. L. Snow & Co.

Sawyer Bros., Millbridge, Me., launched the schooner Lejok last week. Her register is 297 net tons.

The Bestosking Packing & Supply Co. is the name of a company recently organized under the laws of Massachusetts, with headquarters at 170 Summer street, Boston, for the purpose of handling a full and complete line of packings and general mill supplies of that nature. The officers of this company are Mr. J. N. Morrison, president, Mr. George T. Coppins, vice-president, and Mr. Wm. T. Coppins, treasurer. This concern is to be the sole agents in the United States for Turner Bros., Ltd., of England. Turner Bros. are not only the leading manufacturers of asbestos packings of every description in Great Britain, but are the pioneers in the making of crude asbestos into a marketable product. Their goods have received the highest awards for quality. They head the British admiralty list, this being the highest honor a British manufacturer can receive, and their goods are almost exclusively used by the admiralty.

The Lockwood Mfg. Co., East Boston, Mass., well known as builders of steamships, tow boats and marine engines, reports a very busy season in repair work. It is a significant fact that the most, if not quite all, of the repairs to vessels from the great lakes goes to this concern. This company also builds the celebrated Lockwood propeller wheels, which are having a large sale of late.

The American Blower Co. of Detroit is doing a very extensive business in the mechanical draft line. Among other large orders recently received are those from the New Amsterdam Gas Co., Ravenswood, L. I., and the Wilkesbarre (Pa.) Heat, Light & Motor Co. Each of these outfits embraces two large steel plate fans with suitable direct connected engines.

A particularly useful pump for boiler inspectors, marine engineers and boat owners generally, is that which is made by the Marine Iron Works, station A, Chicago, as illustrated on page 41 of their 1901 catalogue, which is sent free on receipt of request.

7



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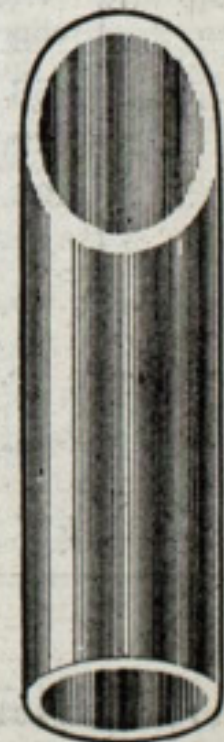
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MODEL TEST FOR STABILITY.

GRADUATES OF THE UNITED STATES NAVAL ACADEMY ARE TO ATTEND THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

The announcement that graduates at the United States naval academy at Annapolis who intend to enter the naval construction corps will hereafter be sent to the Massachusetts Institute of Technology, Boston, for an advanced course in naval architecture, calls attention to the fact that some of the most interesting recent undertakings of the institute have been directly concerned with the building of the new navy. One of the most important of these has had to do with the amount of damage a warship can sustain and still be able to keep the seas. A modern battleship that has cost several million dollars to build is much too expensive and valuable an asset to be risked, and perhaps sacrificed altogether in an inquiry as to how near she can be brought to sinking without actually going to the bottom, but it is none the less desirable to determine exactly how far such a ship may be injured without becoming unseaworthy, as well as how she may be expected to behave, after certain definite damages incidental to battle or storms have been inflicted on her. The stability of a ship under damaged conditions can be figured out with almost mathematical precision by the use of models.

These tests by models were originated by a French naval constructor, Bertin, who first employed them in a study of one of the French cruisers. His method was taken up and exploited by Naval Constructor Woodward of the United States navy, and was soon after adopted in Boston by Prof. Cecil H. Peabody, the head of the institute's department of naval architecture, as a regular part of his courses. Modern ships of war, as every one knows, are protected against the fire of an enemy either by an armor belt or by a protective deck, so called; or by a combination of the two. This leads to the division of fighting ships into two classes, namely, the armored ships and the protected ships. The office of the armor belt is to exclude all except the heaviest projectiles—in fact, it is practically impenetrable by shells containing a really effective proportion of explosive material. The protective deck, on the other hand, which starts from a little below the waterline, and is shaped much like a turtle's shell, is intended to deflect missiles from the engine rooms and boiler rooms—the vitals of the ship—and, by warding off injury from the lower portions of the hull, to keep the buoyancy and, as far as may be, the stability of the vessel unharmed. This latter end, however, the protection of the ship's stability, is very imperfectly attained, so that protected ships are in constant peril of losing their equilibrium from a well-aimed shot from the enemy's guns, although the danger is minimized in actual warfare by the fact that such ships commonly engage in action from so great a distance that a serious injury near the waterline can seldom be inflicted. The question of stability can be solved by computation, without recourse to

the use of models, but the computation required is exceptionally tedious and difficult.

In the method invented by Bertin a complete model is made of the ship whose stability is to be studied, the line of the hull being copied in every detail up to the point of safety—that is, just beyond the line above which shot and shell may be disregarded as a factor in endangering the buoyancy of the vessel. This miniature hull contains a number of removable wooden blocks representing the ship's compartments. In order to demonstrate the behavior of the ship when one of the compartments is broken open to the sea, the wooden block which takes its place in the model is removed and its weight and the weight of the incoming water made up by substituting for the block a piece of lead of the proper size, with the center of gravity in the same place. The effect of removing the block and adding the lead is to sink the model deeper in the water and to cause it to take on a definite inclination or to change trim—or to do both. In this condition of simulated damage the model is still farther inclined by moving a weight athwartships on a graduated scale, thus permitting of a direct experimental determination of the model's stability, until all stability disappears and it is evident that the ship on which the model is patterned would be hopelessly capsized.

In the case of experiments on a protected ship the most interesting question is the effect of breaking open the compartments above the protective deck. A vessel of this class which was recently studied at the institute had four upper coal bunkers on each side above the protective deck, and the experiments which were made on the model showed that if all the bunkers on one side were flooded the ship would immediately capsize. When full of coal the bunkers might be broken open by an enemy's shell without any special harm being done; but they will be full of coal only when the ship has her full supply coming out of port, and they probably will not be full when the need is greatest, since the coal must be transferred from the upper to the lower bunkers as soon as the latter are emptied or the ship will be top-heavy. This special liability to danger is found to exist to some extent in the case of all protected ships, and the fact has been one reason for the recent development of the new type of armored cruiser.

The study of battleships by means of models has brought out a number of striking facts. For example, it has been shown that if a single engine room or a single boiler room is flooded, the loss of stability is very serious, and that if two compartments, as, for example, the boiler room and the engine room on the same side of the ship, are flooded, the ship will capsize. But this danger can be obviated, it has been found, by connecting compartments which adjoin transversely by a door. When this door is opened and both compartments are thus flooded equally on a line running across the ship she will settle on an even keel; she will not lose stability. Supposing two engine rooms to be flooded in this manner, the motive power of the ship would be temporarily put out of commission; but if the door between the two compartments were afterward closed the uninjured engineroom—the one which had not been shattered by the actual fire of the enemy's guns—might be pumped out and made usable,

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Number of Nautical Miles made each year by Steamships of the Messageries Maritimes Co., Provided with Belleville Generators—Since their Adoption in the Service.

Year.	Australien	Polynésien	Armand Béhic	Ville de la Ciotat	Ernest Simons	Chili	Cordillère	Laos	Indus	Tonkin	Annam	Atlantique
1890.....	67,728	2,460										
1891.....	68,247	68,331	204									
1892.....	68,247	68,403	69,822	23,259								
1893.....	68,379	68,343	68,286	68,247								
1894.....	68,439	68,367	68,574	68,439	37,701							
1895.....	68,673	68,766	68,739	68,808	40,887	28,713						
1896.....	69,534	92,718	69,696	69,549	62,205	63,153	40,716					
1897.....	68,250	69,606	92,736	69,555	62,235	76,110	63,357	43,146				
1898.....	70,938	69,534	69,552	69,597	62,526	63,240	63,240	62,553	63,954	22,707		
1899.....	69,534	69,615	67,431	90,405	60,246	62,778	62,868	52,344	54,855	44,007	22,884	
1900.....	69,534	67,494	69,744	69,564	61,719	62,382	62,502	51,471	53,373	62,016	63,066	52,140
Total.....	757,503	713,637	644,784	597,423	387,519	356,376	292,683	209,514	172,182	128,730	85,950	52,140

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while the ship could be trimmed by flooding a boiler room on the same side of the boat. The experiments with the model show conclusively that if this were done the ship would not lose stability, and at the same time, of course, she would be able to use half her motive power.

The tests at the institute include the solution of other and more intricate problems than those which have just been explained. But one result of the experiments undertaken has been to explode the popular fallacy in believing that the safety of a twin-screw steamer is assured by dividing it into practically two ships by means of fore-and-aft bulkheads. Such a division, on the contrary, always means dangerous instability in the event of injury to the hull, whether for the passenger ship or man-of-war, and it means, furthermore, that in such case the man-of-war would be unable, on account of her list to one side or the other, to use her guns, and would consequently be at the mercy of an enemy.

GASOLINE ENGINES FOR SUBMARINE BOATS.

The Otto Gas Engine Works of Philadelphia has recently built a series of gasoline engines especially constructed for submarine boats. Nine of these engines have been completed, seven of which are for the United States navy. Five engines are being built for the British admiralty and others will soon be in course of construction. The first submarine boat Holland, built some years ago, was equipped with a 50 H.P. gasoline engine and the performance of this engine has undoubtedly been an important factor in selecting the motors for the larger boats now under construction. The engines are of the Otto cycle type with four single-acting cylinders, inverted, with crank shaft below and supported by three main bearings on the engine bed. The distribution of the cranks and the timing of the valves and igniters are arranged so that the operations in the four cylinders alternate, so that while one is on the expansion stroke the other three are on the suction, compression and exhaust strokes respectively. With this arrangement the engine is, of course, perfectly balanced and the vibration when working in the boat is reduced to a minimum. The starting of these engines is rendered easy through the use of a small hand pump, which supplies a mixture of air and fuel from a reservoir attached to the starter, and as soon as a proper charge is thus admitted and compressed in each cylinder, the electric current is connected to the igniters, after which the engine is started by a simple movement of the operator's hand. One man can turn the fly wheel to bring the engine in starting position, pump in the mixture and start the engine.

The first engine, tested in 1900, developed 160.4 brake horse power at a speed of 320 revolutions per minute. The contract specifications called for 160 brake horse power at 360 revolutions per minute, but when the tests showed that the engine developed over 190 brake horse power at 360 revolutions per minute, it was agreed by the contractors and the Holland Torpedo Boat Co., and approved by the United States government inspector, that the speed should be reduced to 320 revolutions. Exhaustive trials showed that the engine was fully capable of developing the maximum brake horse power at the higher speed. The fuel consumption of the first engine was measured to be .88 of a pint of gasoline, .74 specific gravity (Beaume scale). Engines of the same type tested subsequently showed even better results, both in power and fuel consumption. The

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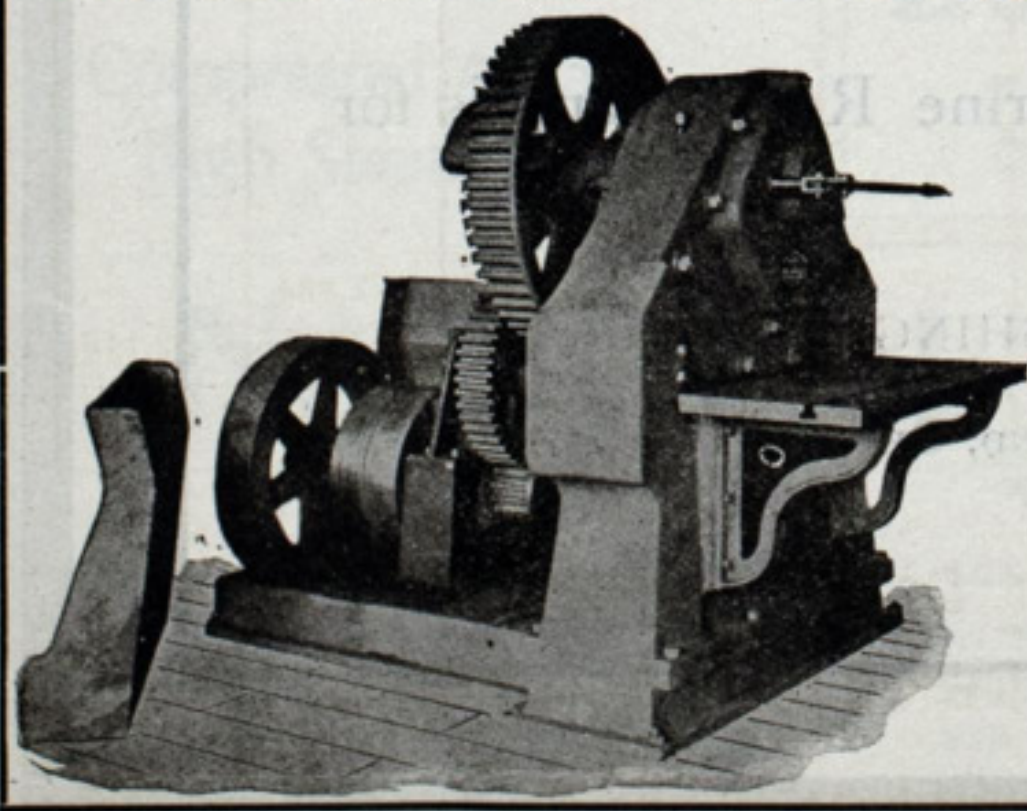
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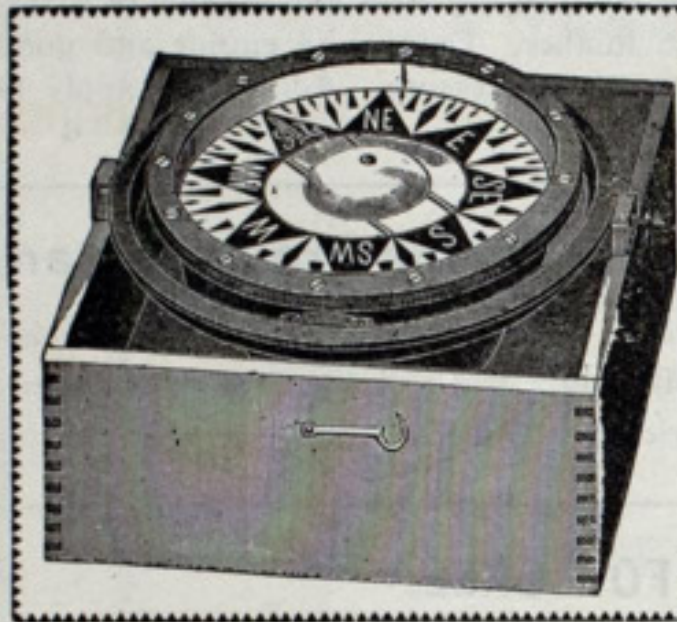
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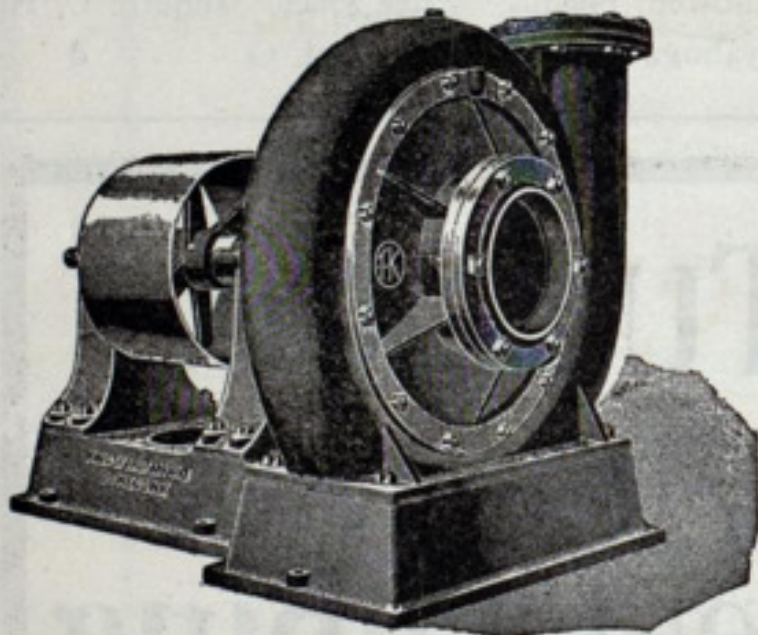


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"WARWICK" SHIP DRIVING IRON,
SPECIAL HEAD MACHINE AND
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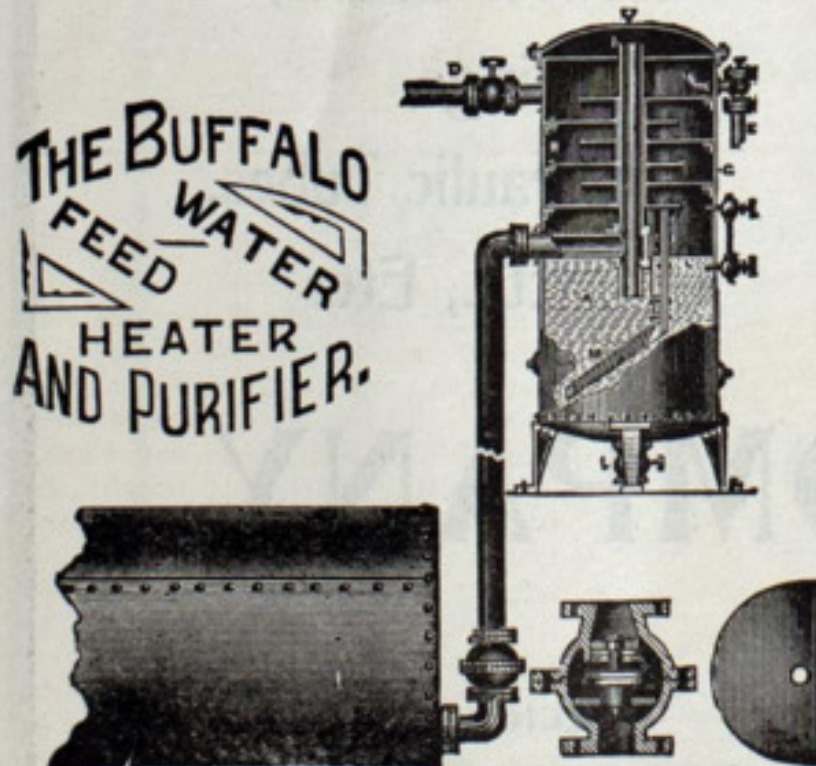
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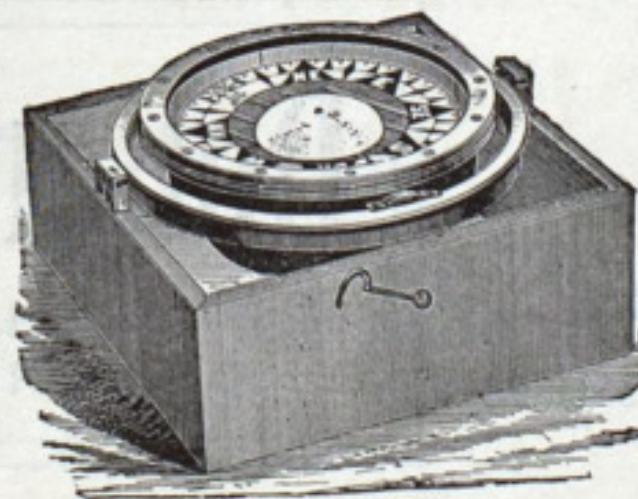


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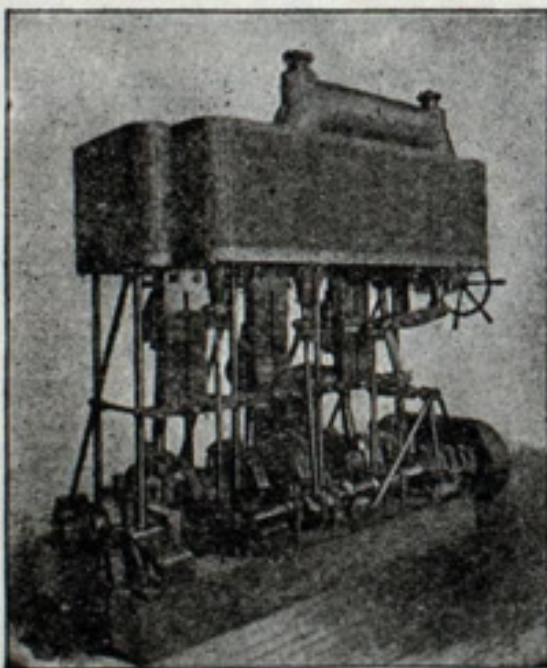
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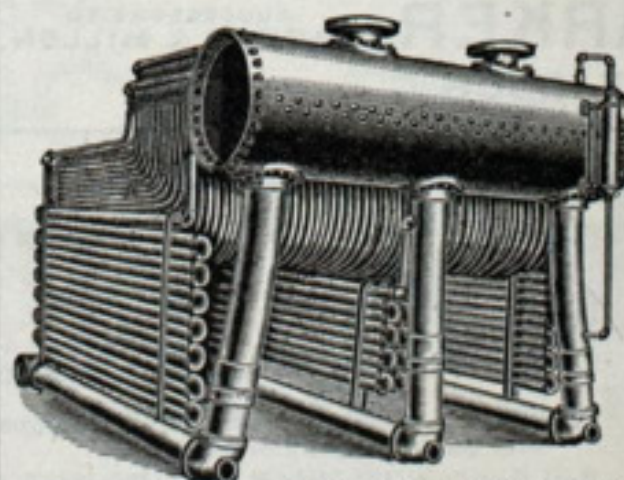
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Western Reserve Building, CLEVELAND, O.

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Tells the circulations of all American newspapers. Revised, corrected and reissued every three months. Sixteen hundred pages: Price Five Dollars a volume or \$20 a year.

BUFFALO.

We should hardly know how to get along without the American Newspaper Directory. We regard it by all odds the most complete and reliable guide that the advertiser can make use of; in fact, we use no other.

Buffalo, N. Y., July 24, 1901.

R. V. Pierce, M. D.,
President World's Dis. Med. Ass'n.

VERMONT.

The American Newspaper Directory stands, as it has always stood, the first and best of newspaper directories—the only one which cannot be ignored, the only one which every advertiser must have. No other can take its place; no other is needed—Joseph Auld, in the Burlington (Vt.) News of July 3, 1896.

ADVISOR.

The Advisor accepts the American Newspaper Directory as the standard in newspaper ratings. The obstacles which obstruct its efforts to get true and reliable information are many.

The directory question is one which interests every publisher in the country—nay, the entire world. But in the United States directories are becoming altogether too numerous. In this, as with other books of reference, it is necessary to have one which may be relied on as being an authority on the matter of newspaper circulations. There can be no question about the fact that at this time, as for many years past, the American Newspaper Directory is that authority. The Advisor is not paid to make this announcement. It makes the statement in the interests of advertisers and publishers because it is true. One thing the advertiser is almost cock-sure of when he refers to the American Newspaper Directory is that the circulation figures he sees therein are not overstated to any great extent. In most other directories they are. Only the publisher himself is to be blamed for not securing a proper rating in that publication, and every advertiser of consequence knows it. Thus the publisher who refuses to furnish a statement places himself under a reasonable suspicion.—The Advisor for June, New York, June, 1901.

CHICAGO.

Messrs. Geo. P. Rowell & Co.'s American Newspaper Directory has long since earned the reputation of being the best of its character. It contains the results of patient, expensive and systematic effort to secure all attainable information of interest concerning American newspapers. The work has been honestly done. This will not be questioned by any unprejudiced examiner. The most important question is circulation. In attempting to give this information the editor of the Directory encounters his most difficult work. It is the aim and necessity of the Directory to give the truth. The American Newspaper Directory is to-day the dependence and guide, in a greater or less degree, of every large advertiser in the country.—Chicago (Ill.) Daily News.

BATES.

The American Newspaper Directory is the only reliable guide for the advertiser. No man who advertises can afford to do without it.

What Bradstreet and Dun are to the mercantile world the American Newspaper Directory is to the world of periodical publications.

A new advertiser will get from the American Newspaper Directory a better idea of the greatness of his country, and the tremendous possibilities in newspaper advertising, than from any other source.

If an advertiser spends only \$100 a year he should have the American Newspaper Directory. For his business may grow and his right expenditure of his money become increasingly important. The time to learn how to spend \$10,000 is before it is spent, otherwise the spending may be disastrous.

Many times the best paper in town costs the advertiser no more than the poorest. The American Newspaper Directory tells which is which.

The paper that was the leader in its town five years ago may lag behind today. Even one year may witness astonishing changes. If you are spending money for publicity it is vastly important that you should know where to get the most of it for the price. The American Newspaper Directory gives not only the present circulation rating of every paper in America, but shows their history by quoting past ratings.

The book costs five dollars a copy, and a single reference to it may readily save or make many times its cost.

All newspaper directories but one are erroneously optimistic about circulations. The American Newspaper Directory may occasionally err on the other side, but that makes it all the safer for the advertiser.

My advertising experience began in 1885, and one of the first things I did was to buy a copy of the American Newspaper Directory.

For sixteen years Rowell's "The Ameri-

can Newspaper Directory" has had a place of honor and usefulness on my desk.

Many a publisher is ready to prove by other directories that "Rowell's is wrong," but few indeed can be induced to prove it by opening their circulation books to the advertiser.

Among publishers who are not willing that their real circulations be known it is the best hated book in print. The moral is not far to find.

Charles Austin Bates.

New York, June 24, 1901.

PABST.

If the improvement of the American Newspaper Directory continues in the future as it has during the past twenty years I do not think I shall live long enough to see any other directory take its place. There will, however, be the usual crop of directories, just as every other good thing is limited. Your long years of experience in dealing with evasive circulation reports have most admirably fitted you for placing a proper valuation upon such statements. Advertisers have come to know that the Rowell estimates are nearer the proper figure than can otherwise be obtained. The American Newspaper Directory is therefore indispensable in every well regulated advertising department. Lines are being more tightly drawn every day; it is difficult to collect for twenty thousand when you print only eight. If the advertiser were buying barley he would not accept three pecks for a bushel, although the quality might at all times be open for discussion. The American Newspaper Directory is the guide and companion of the advertising man, and it is to the interests of all concerned to help perfect it, support it and hurrah for it.

Pabst Brewing Co.,

J. R. Kathrens, Adv. Mgr.

Milwaukee, Wis., June 7, 1901.

SAPOLIO.

A growing need created it—the advertising agency system. One of the earliest and most successful workers, Geo. P. Rowell, is still in the field. He originated methods. Others followed. A first early step in advance was his publication of a list of all the papers—the American Newspaper Directory. He has never ceased to love it, and labor for it. Soon, out of the gross stupidity of imitation, it became a rule that every agency down to those of Oshkosh or Oklahoma must issue its own directory. An awful waste, for not more than one out of ten was worth shelf room. If the National Association of Advertising Agents could agree long enough to buy Mr. Rowell's Directory, publish it officially and drop all the others, it would accomplish something.

Artemas Ward,

Advertising Manager for Sapolio.

—In Fame, March, 1901.

WASHINGTON.

Every page of the American Newspaper Directory breathes the desire of its publishers that it shall be absolutely correct in every statement it makes.

Truly yours, Frank Roe Batcheld,
Clerk of the Committee on Banking and Currency, House of Representatives, U. S. Washington, D. C., Jan. 17, 1899.

SOUTHERN.

We subscribe to and pay cash for the American Newspaper Directory, and find it of great value in our advertising department. We have 6,892 miles of railway, extending from Washington, D. C., all over the South, and in advertising this system we use more than 1,000 publications, and in selecting this list we find that we get a correct idea of circulation from this Directory that can not be obtained from any other similar publication. We receive other newspaper directories gratis; but the fact that we pay cash for this one in addition shows that we can not place the same dependence upon the "free list."

We thoroughly appreciate the careful manner in which this Directory is compiled.

Washington, D. C., Sept. 13, 1900.

Jos. H. Hannen,

Adv. Dept. Southern Railway.

I am looking forward to receiving the new edition with a great deal of anticipation as, although the American Newspaper Directory seemed to have reached a high state of perfection several years ago, there is always something new and of value in each succeeding edition. It is regarded as the standard authority with the Southern Railway.

S. H. Hardwick,

General Passenger Agent.

Washington, D. C., May 21, 1901.

BALTIMORE.

We have used the American Newspaper Directory for many years and find it more valuable to us than any other similar publication. Much of the information given we cannot obtain in any other way. The book is not only a great help but a necessity to our business, and we think its way of stating circulations is the ideal one.

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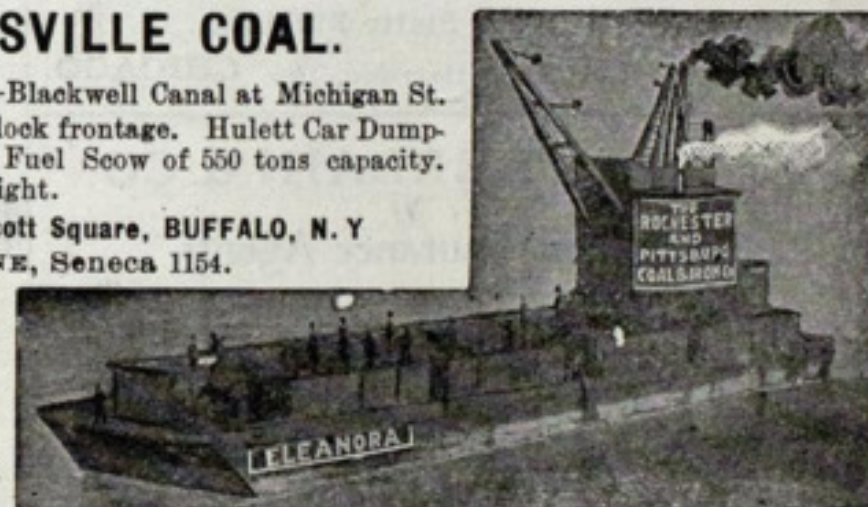
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 Pittsburgh Coal Co.....Cleveland.
 Rochester & Pittsburgh Coal & Iron Co.....Buffalo.
 Scott Co., The W. L.....Erie, Pa.
 Smith, Stanley B. & Co.....Detroit.
 Youghlougheny & Lehigh Coal Co.....Chicago.

GAS BUOYS.

Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.

Chase Machine Co.....Cleveland.
 Lake Shore Engine Works.....Marquette, Mich.
 Olds Motor Works.....Detroit.

GAGES, STEAM AND VACUUM.

American Steam Gauge Co.....Boston.
 Ashton Valve Co.....Boston.
 Crosby Steam Gauge & Valve Co.....Boston.

GRAPHITE.

Dixon Crucible Co., Joseph.....Jersey City, N. J.

GRAPHITE BUSHINGS AND BEARINGS.

Graphite Lubricating Co.....Bound Brook, N. J.

HAMMERS, PNEUMATIC.

Standard Pneumatic Tool Co.....Chicago.

HAMMERS, STEAM.

Bement, Miles & Co.....Philadelphia.
 Chase Machine Co.....Cleveland.
 Niles Tool Works Co.....Hamilton, O.

HATCH GEARS.

"Long Arm" System Co.....Cleveland.

HAWERS, WIRE.

American Steel & Wire Co.....Chicago.

HEATING APPARATUS.

Sturtevant, B. F. Co.....Boston.

HOISTS FOR CARGO, ETC.

American Ship Building Co.....Cleveland.
 Brown Hoisting Machinery Co., Incorporated.....Cleveland.
 Chase Machine Co.....Cleveland.
 Elwell-Parker Electric Co.....Cleveland.
 General Electric Co.....New York.
 Hodge, S. F. & Co.....Detroit.
 Hyde Windlass Co.....Bath, Me.
 Lidgerwood Mfg. Co.....New York.
 Marine Iron Co.....Bay City.
 Westinghouse Electric & Mfg. Co.....Pittsburg.

HOSE FOR PNEUMATIC TOOLS.

Sayen & Schultz.....Philadelphia.

HYDRAULIC MACHINERY.

Bement, Miles & Co.....Philadelphia.
 Watson-Stillman Co., The.....New York.
 Wood & Co., R. D.....Philadelphia.

INDICATORS FOR STEAM ENGINES.

American Steam Gauge Co.....Boston.
 Ashton Valve Co.....Boston.
 Crosby Steam Gauge & Valve Co.....Boston.

IGNITERS FOR GAS ENGINES.

Holtzer-Cabot Electric Co.....Brookline, Mass.

INJECTORS.

Crane Co.....Chicago.
 Jenkins Bros.....New York.

INSURANCE, MARINE.

Brown & Co.....Buffalo.
 Chamberlain & Co., S. R.....Chicago.
 Drake & Maytham.....Buffalo.
 Elphicke, C. W. & Co.....Chicago.
 Helm, D. T. & Co.....Duluth, Minn.
 Hutchinson & Co.....Cleveland.
 Keith, J. G. & Co.....Chicago.
 La Salle & Co.....Duluth.
 Mitchell & Co.....Cleveland.
 Osborn, F. H. & Co.....Chicago.
 Parker, A. A. & W. B.....Detroit.
 Peck, Chas. E. & W. F.....New York and Chicago.
 Richardson, W. C.....Cleveland.
 Sullivan, D. & Co.....Chicago.
 Tandy, Frank N.....Boston.

IRON ORE AND PIG IRON.

Bourne-Fuller Co.....Cleveland.
 Hanna, M. A. & Co.....Cleveland.
 Pickands, Mather & Co.....Cleveland.

IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.
 Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

LATHES OF ALL KINDS.

Niles Tool Works Co.....Hamilton, O.
 Pratt & Whitney Co.....Hartford, Conn.

LAUNCHES—NAPHTHA, ELECTRIC.

Gas Engine & Power Co.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.

Armstrong Cork Co.....Pittsburg.
 Drein, Thos. & Son.....Wilmington, Del.
 Kahnweiler's Sons, D.....New York.
 Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.

Page Bros. & Co.....Boston.
 Porter's Sons' Co., Wm.....New York.

LOGS.

Walker & Son, Thomas.....Birmingham, Eng.
 Also Ship Chandlers.

MACHINE TOOLS (WOOD WORKING).

Atlantic Works, Inc.....Philadelphia.

MACHINE TOOLS.

Bement, Miles & Co.....Philadelphia.
 Niles Tool Works Co.....Hamilton, O.
 Pond Machine Tool Co.....Plainfield, N. J.
 Pratt & Whitney Co.....Hartford, Conn.

MALLET FOR CAULKERS, BOILER MAKERS, ETC.

N. Y. Mallet & Handle Works.....New York.

MARINE RAILWAYS, BUILDERS OF

Crandall & Son, H. I.....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W.....New York.
 Lein, Irvine & Co.....New York.

MECHANICAL DRAFT FOR BOILERS.

American Blower Co.....Detroit.
 American Ship Building Co.....Cleveland.
 Boston Blower Co.....Hyde Park, Mass.
 Bloomsburg & Co., H.....Newport News, Va.
 Buffalo Forge Co.....Buffalo.
 Detroit Shipbuilding Co.....Detroit.
 Sturtevant, B. F. Co.....Boston.

METALLIC PACKING.

Katzenstein, L. & Co.....New York.
 U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.

Cramp, Wm. & Sons.....Philadelphia.
 Phosphor Bronze Smelting Co., Ltd.....Philadelphia.

METAL POLISH.

Bertram's Oil Polish Co.....Boston, Mass.
 Paul & Co., J. C.....Chicago.

MILLING MACHINES OF ALL KINDS.

Bement, Miles & Co.....Philadelphia.
 Niles Tool Works Co.....Hamilton, O.

NAUTICAL INSTRUMENTS.

Bliss, John & Co.....New York.
 Ritchie, E. S. & Sons.....Brookline, Mass.

NAVAL ARCHITECTS.

Gaskin, Edward.....Buffalo.
 See, Horace.....New York.
 Wood, W. J.....Chicago.

OAKUM.

Stratford Oakum Co., Geo.....Jersey City, N. J.

OILS AND LUBRICANTS.

Dixon Crucible Co., Joseph.....Jersey City, N. J.
 Standard Oil Co.....Cleveland.

PACKING.

Crane Co.....Chicago.
 Garlock Packing Co.....Palmyra, N. Y.
 Jenkins Bros.....New York.
 Katzenstein, L. & Co.....New York.
 Sayen & Schultz.....Philadelphia.
 U. S. Metallic Packing Co.....Philadelphia.

PAINTS.

Baker, Howard H. & Co.....Buffalo.
 Toch Bros.....New York.
 Upson-Walton Co.....Cleveland.

PATENT ATTORNEYS.

Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.

Atlantic Works, Inc.....Philadelphia.

PIPE THREADING AND CUTTING MACHINES.

Merrell Mfg. Co.....Toledo, O.

PIPE, WROUGHT IRON.

Bourne-Fuller Co.....Cleveland.
 Crane Co.....Chicago.

PLANERS OF ALL KINDS.

Bement, Miles & Co.....Philadelphia.
 Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.

Atlantic Works, Inc.....Philadelphia.

PLATE BENDING AND PLANING MACHINES.

Bement, Miles & Co.....Philadelphia.
 Cleveland Punch & Shear Works Co.....Cleveland.
 Niles Tool Works Co.....Hamilton, O.
 Wood & Co., R. D.....Philadelphia.

PLUMBING, MARINE.

Reilly Repair & Supply Co., James.....New York.
 Sands, Alfred B. & Son.....New York.

PNEUMATIC TOOLS.

Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.

Bertram's Oil Polish Co.....Boston.
 Paul & Co., J. C.....Chicago.

PRESSURE REGULATORS.

D'Este Co., Julian.....Boston.

PROPELLER WHEELS.

American Ship Building Co.....Cleveland.
 Atlantic Works.....East Boston, Mass.
 Bath Iron Works, Ltd.....Bath, Me.
 Cramp, Wm. & Sons.....Philadelphia.
 Detroit Shipbuilding Co.....Detroit.
 Farrar & Trefts.....Buffalo.
 Fore River Ship & Engine Co.....Quincy, Mass.
 Hardy, John B.....Tacoma, Wash.
 Hyde Windlass Co.....Bath, Me.

Harlan & Hollingsworth Co.....Wilmington, Del.
 Hodge, S. F. & Co.....Detroit.
 Jenks Ship Building Co.....Port Huron, Mich.
 Lockwood Mfg. Co.....East Boston, Mass.
 MacKinnon Mfg. Co.....Bay City, Mich.
 Maryland Steel Co.....Sparrow's Point, Md.
 Moran Bros. Co.....Seattle, Wash.
 Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
 Newport News Ship Building Co.....Newport News, Va.
 Nixon, Lewis.....Elizabeth, N. J.
 Phosphor Bronze Smelting Co., Ltd.....Philadelphia.
 Pusey & Jones Co.....Wilmington, Del.
 Risdon Iron Works.....San Francisco.
 Sheriffs Mfg. Co.....Milwaukee.
 Trigg, Wm. R. Co.....Richmond, Va.
 Trout, H. G.....Buffalo.

PROJECTORS, ELECTRIC.

Badt-Goltz Engineering Co.....Chicago.
 Elwell-Parker Electric Co.....Cleveland.
 General Electric Co.....Schenectady, N. Y.
 Rushmore Dynamo Works.....Jersey City, N. J.
 Seidler-Miner Electric Co.....Detroit.
 Westinghouse Electric & Mfg. Co.....Pittsburg.

PUMPS FOR VARIOUS PURPOSES.

Blake, Geo. F. Mfg. Co.....New York.
 Kingsford Foundry & Machine Works.....Oswego, N. Y.
 Wood, R. D. & Co.....Philadelphia.
 Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.

Bement, Miles & Co.....Philadelphia.
 Cleveland Punch & Shear Works Co.....Cleveland.
 Niles Tool Works Co.....Hamilton, O.
 Wood, R. D. & Co.....Philadelphia.

REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.

Standard Automatic Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.

Bourne-Fuller Co.....Cleveland.
 Champion Rivet Co.....Cleveland.

R. I. W. DAMP RESISTING PAINT.

Toch Bros.....New York.

RIGGING ROPE (WIRE).

American Steel & Wire Co.....Chicago.

RUBBER GOODS.

Hale Rubber Co., Alfred.....So. Boston, Mass.

RUBBER INSULATED WIRES.

Roebling's Sons, John A.....New York and Cleveland.
 American Steel & Wire Co.....Chicago.

SAFETY VALVES.

American Steam Gauge Co.....Boston.
 Ashton Valve Co.....Boston.
 Crosby Steam Gauge & Valve Co.....Boston.

SAIL MAKERS.

Baker, Howard H. & Co.....Buffalo.
 Upson-Walton Co.....Cleveland.
 Wilson & Silsby.....Boston.

SALVAGE COMPANIES.

See wrecking companies.

SEAM COMPOSITION AND ELASTIC SEAM PAINT.

Cole & Kuhls.....Brooklyn.

SEARCH LIGHTS.

Badt-Goltz Engineering Co.....Chicago.
 Elwell-Parker Electric Co.....Cleveland.
 General Electric Co.....Schenectady, N. Y.
 Rushmore Dynamo Works.....Jersey City, N. J.
 Seidler-Miner Electric Co.....Detroit.
 Westinghouse Electric & Mfg. Co.....Pittsburg.

SHAPERS.

Bement, Miles & Co.....Philadelphia.
 Niles Tool Works Co.....Hamilton, O.
 Pratt & Whitney Co.....Hartford, Conn.

SHEARS.

See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.

American Ship Building Co.....Cleveland.
 Atlantic Works.....East Boston, Mass.
 Bath Iron Works, Ltd.....Bath, Me.
 Buffalo Dry Dock Co.....Buffalo.
 Cramp, Wm. & Sons.....Philadelphia.
 Craig Ship Building Co.....Toledo, O.
 Chicago Ship Building Co.....Chicago.
 Detroit Shipbuilding Co.....Detroit.
 Fore River Ship & Engine Co.....Quincy, Mass.
 Hardy, John B.....Tacoma, Wash.
 Harlan & Hollingsworth Co.....Wilmington, Del.
 Jenks Ship Building Co.....Port Huron, Mich.
 Lockwood Mfg. Co.....East Boston, Mass.
 Maryland Steel Co.....Sparrow's Point, Md.
 Moran Bros. Co.....Seattle, Wash.
 Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
 Newport News Ship Building Co.....Newport News, Va.
 Nixon, Lewis.....Elizabeth, N. J.
 Pusey & Jones Co.....Wilmington, Del.
 Risdon Iron Works.....San Francisco.
 Roach's Ship Yard.....Chester, Pa.
 Trigg, Wm. R. Co.....Richmond, Va.
 Willard, Chas. P. & Co.....Chicago.

SHIP CHANDLERS.

Baker, Howard H. & Co.....Buffalo.
 Moran Bros. Co.....Seattle, Wash.
 Reilly Repair & Supply Co., James.....New York.
 Upson-Walton Co.....Cleveland.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

SPARS—LARGE SIZES.

Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.

Holmes, Samuel.....New York.

STEAMSHIP LINES, PASS. AND FREIGHT.

Algoma Central Co.....Sault Ste. Marie, Ont.
 American Line.....New York.
 Cleveland & Buffalo Transit Co.....Cleveland.
 Dominion Line.....Boston.
 Erie & Western Trans. Co.....Buffalo.
 International Nav. Co.....Philadelphia.
 Red Star Line.....New York.

STEEL CASTINGS.

Seaboard Steel Casting Co.....Chester, Pa.

STEERING APPARATUS.

American Ship Building Co.....Cleveland.
 Chase Machine Co.....Cleveland.
 Detroit Shipbuilding Co.....Detroit.
 Electro-Dynamic Co.....Philadelphia.
 Hyde Windlass Co.....Bath, Me.
 Jenks Ship Building Co.....Port Huron, Mich.
 Queen City Engineering Co.....Buffalo.
 Sheriffs Mfg. Co.....Milwaukee.

STOCKS, BONDS, SECURITIES.

Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.

Baldt Anchor Co.....Chester, Pa.
 International Anchor Co.....Cleveland.

SUBMARINE DIVING APPARATUS.

Hale Rubber Co., Alfred.....So. Boston, Mass.
 Schrader's Son, A.....New York.

SURVEYORS, MARINE.

Gaskin, Edward.....Buffalo.
 See, Horace.....New York.
 Wood, W. J.....Chicago.

TELEGRAPH—DECK AND ENGINE ROOM.

Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.

Hunt, Robert W. & Co.....Chicago.
 Pittsburgh Testing Laboratory, Ltd.....Pittsburg.

THERMOMETERS FOR MECHANICAL PURPOSES.

Helios-Upton Co.....Peabody, Mass.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Bement, Miles & Co.....Philadelphia.
 Cleveland Punch & Shear Works Co.....Cleveland.
 New Doty Mfg. Co.....Janesville, Wis.
 Niles Tool Works Co.....Hamilton, O.
 Pond Machine Tool Co.....Plainfield, N. J.
 Pratt & Whitney Co.....Hartford, Conn.
 Standard Pneumatic Tool Co.....Chicago.
 Watson-Stillman Co.....New York.
 Wood, R. D. & Co.....Philadelphia.

TOOLS, WOOD WORKING.

Atlantic Works, Inc.....Philadelphia.

TOPOPHONE—Prevents disasters in fogs.

Colt Co. J. B.....New York.

TOWING MACHINES.

American Ship Windlass Co.....Providence, R. I.
 Chase Machine Co.....Cleveland.

TOWING COMPANIES.

Donnelly Salvage & Wrecking Co.....Kingston, Ont.
 Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
 Swain Wrecking Co.....Detroit.

TRAPS, STEAM.

D'Este Co., Julian.....Boston.
 Haines Co., Wm. S.....Philadelphia.

TRUCKS.

Boston & Lockport Block Co.....Boston.

TUBING, SEAMLESS.

Benedict & Burnham Mfg. Co.....Waterbury, Conn.
 Standard Seamless Tube Co.....Pittsburg.

VALVES, STEAM SPECIALTIES, ETC.

American Steam Gauge Co.....Boston.
 Ashton Valve Co.....Boston.
 Crane Co.....Chicago.
 Crosby Steam Gauge & Valve Co.....Boston.
 D'Este Co., Julian.....Boston.
 Jenkins Bros.....New York.
 Wood & Co., R. D.....Philadelphia.

VARNISH PAINT.

Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.

Boland, John J.....Buffalo.
 Brown & Co.....Buffalo.
 Chamberlain & Co., S. R.....Chicago.
 Drake & Maytham.....Buffalo.
 Elphicke, C. W. & Co.....Chicago.

Hall & Root.....Buffalo.
 Helm, D. T. & Co.....Duluth, Minn.
 Holmes, Samuel.....New York.
 Hutchinson & Co.....Cleveland.
 Keith, J. G. & Co.....Chicago.
 Kennedy Hunter & Co.....Antwerp.
 Mitchell & Co.....Cleveland.
 Richardson, W. C.....Cleveland.
 Sullivan, D. & Co.....Chicago.
 Tandy, Frank N.....Boston.

VENTILATING APPARATUS FOR SHIPS.

American Blower Co.....Detroit.
 Boston Blower Co.....Hyde Park, Mass.
 Buffalo Forge Co.....Buffalo.
 Sturtevant, B. F. Co.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.

American Steel & Wire Co.....Chicago.
 Baker, H. H. & Co.....Buffalo.
 Roebling's Sons, John A.....New York and Cleveland.
 Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.

American Steam Gauge Co.....Boston.
 Ashton Valve Co.....Boston.
 Crosby Steam Gauge & Valve Co.....Boston.

WINDLASSES.

American Ship Windlass Co.....Providence, R. I.
 American Ship Building Co.....Cleveland.
 Hyde Windlass Co.....Bath, Me.
 Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.

American Ship Windlass Co.....Providence, R. I.
 Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.

Atlantic Works, Inc.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.

Donnelly Salvage & Wrecking Co.....Kingston, Ont.
 Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
 Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.

Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.

Drein, Thos. & Son.....Wilmington, Del.
 Gas Engine & Power Co.....New York.
 Lane & DeGroot.....Brooklyn.
 Willard, Chas. P. & Co.....Chicago.

YAWLS.

Drein, Thos. & Son.....Wilmington, Del.
 Lane & DeGroot.....Brooklyn.

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MORAN BROS. COMPANY

SEATTLE, WASHINGTON

SHIP AND ENGINE BUILDERS
STEEL AND WOOD VESSELS, STEAM OR SAIL
FOR OCEAN, SOUND AND RIVER SERVICE

FOUNDRI, MACHINE, BOILER AND FORGE SHOPS
LARGEST TOOLS AND EQUAL TO ANY REQUIREMENT
HEAVY FORGINGS A SPECIALTY

DRY DOCK AND MARINE RAILWAY

Two-Section balanced floating dry dock, 400 ft. long, 60 ft. between towers; patent steel wedge keel blocks; 12,000 tons displacement.
CAPACITY OF MARINE RAILWAY 1500 TONS

SHIP CHANDLERY, ENGINEERS' SUPPLIES

SAW AND PLANING MILL

CAPACITY: TIMBER, 48 INCHES SQUARE, 125 FEET LONG
Including every description of ROUGH, DRESSED or KILN DRIED
YELLOW FIR, RED CEDAR or SPRUCE
We make a specialty of long and large timber and can DRESS FOUR SIDES 20 x 30 INCHES.

SPARS THE LONGEST, LARGEST, CLEAREST AND BEST IN THE WORLD; ROUGH OR HEWN.
PILES OR TIMBER OF ANY DESCRIPTION.

CARS FROM ALL TRANSCONTINENTAL ROADS
ENTER OUR YARDS AND DOCKS
DOCK SHIPMENTS TO ALL PARTS OF THE WORLD

ELECTRIC CRANE Capacity to transfer 75 tons from car to vessel
WE INVITE CORRESPONDENCE

LAKE SHORE & MICHIGAN SOUTHERN RAILWAY.

CLEVELAND CITY TICKET OFFICE 237 SUPERIOR ST

Eastward:—		Ar. fr. West.	Dep. East.
No. 18, Southwestern Limited	*1 55 am
No. 22, Lake Shore Limited	*2 15 am	*2 20 am
No. 26, Pan-American Express	*5 50 am	*6 00 am
No. 28, New York & Boston Express	*7 40 am	*8 00 am
No. 32, Fast Mail	*11 25 am	*11 30 am
No. 44, Accommodation, via Sandusky	†1 35 pm
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No. 2, Day Express	*11 05 pm	†11 30 pm
No. 126, Norwalk Accommodation	†7 55 am
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No. 11, Southwestern Limited	*3 25 am
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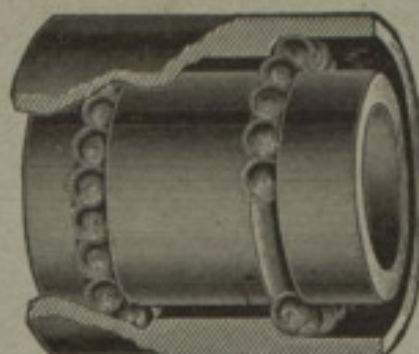
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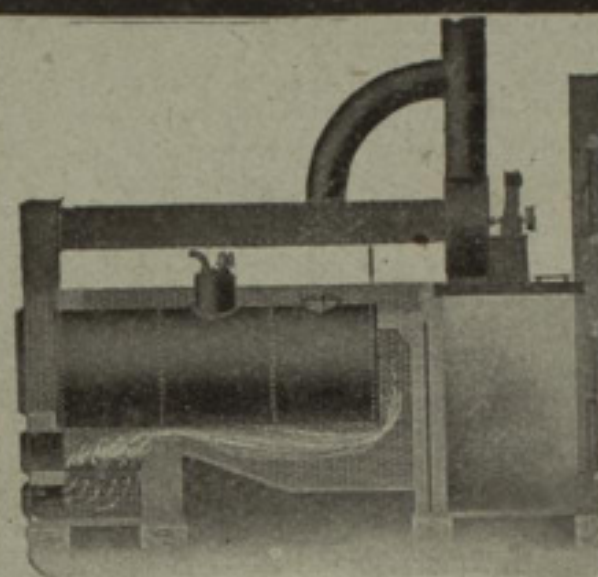
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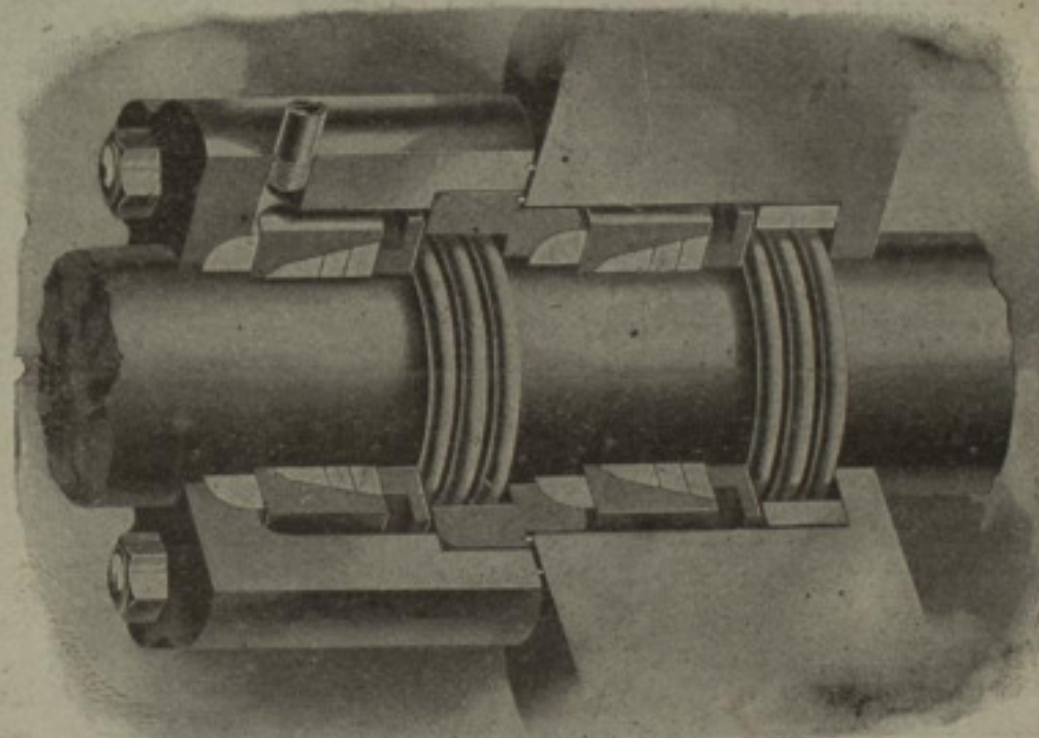
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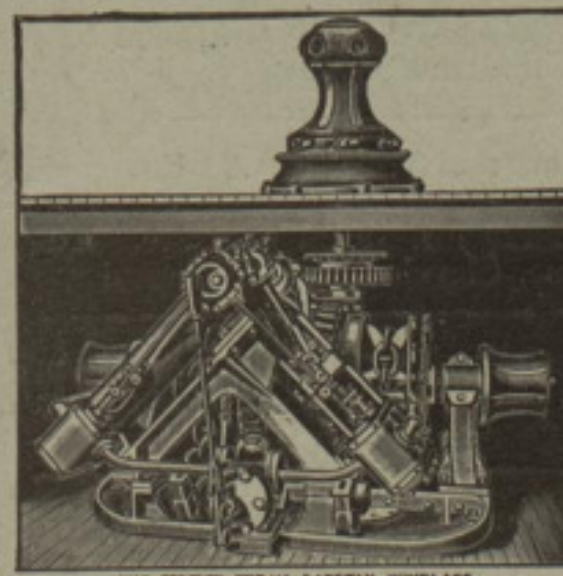
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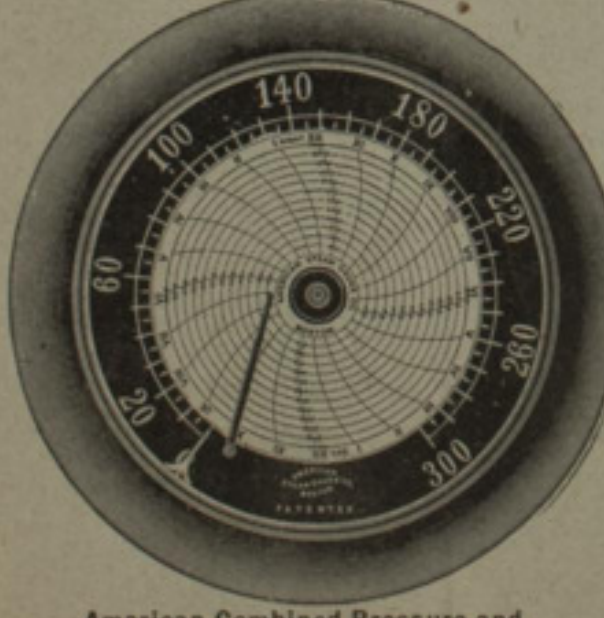
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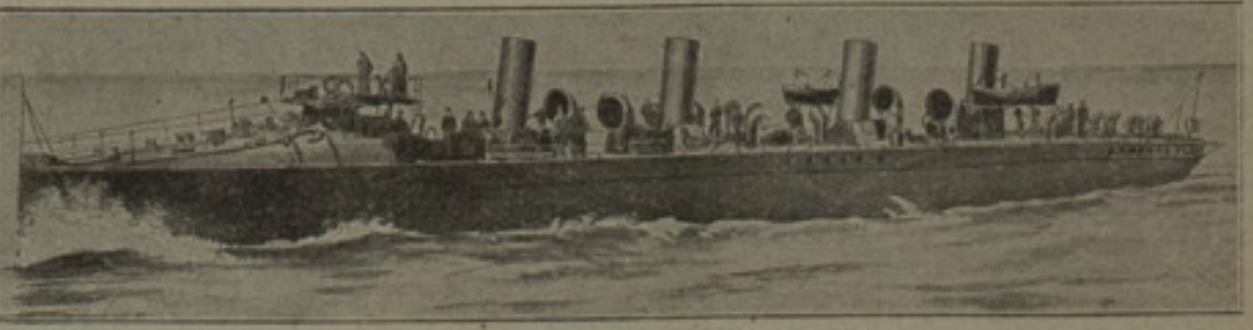
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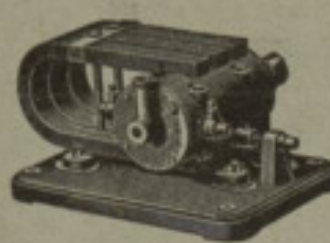


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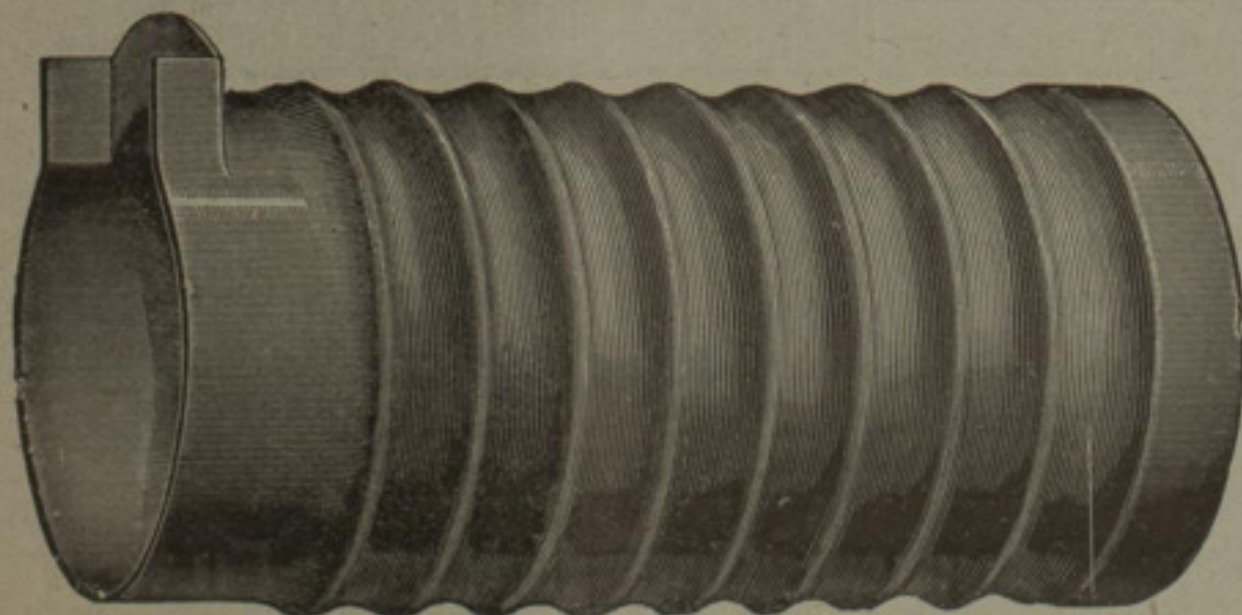
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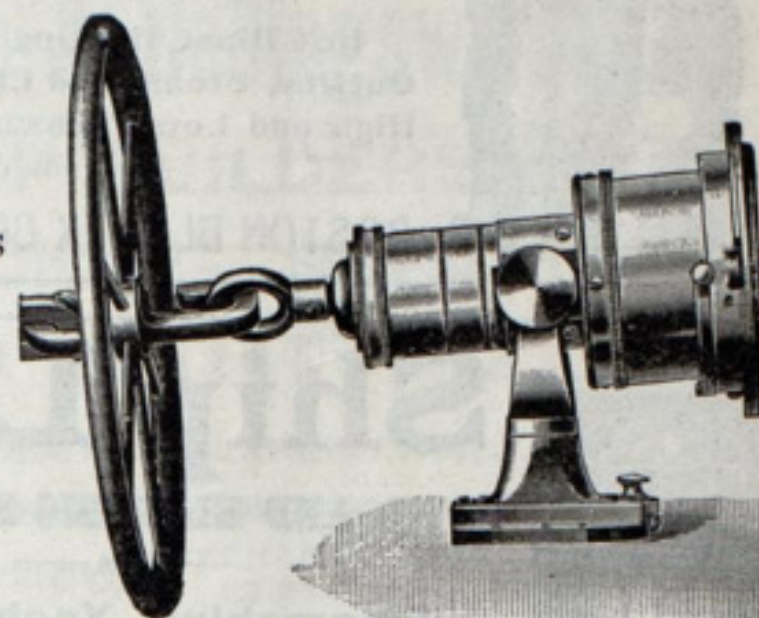
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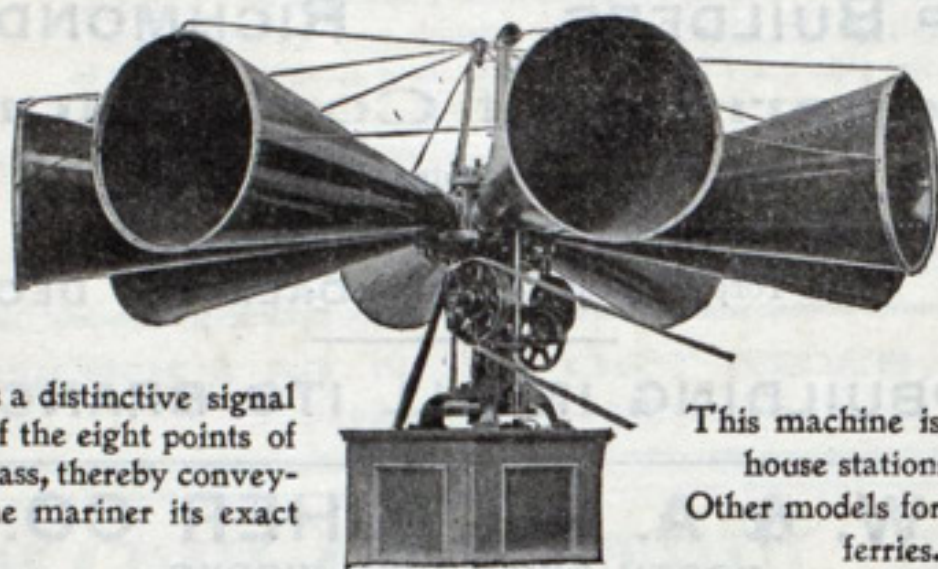
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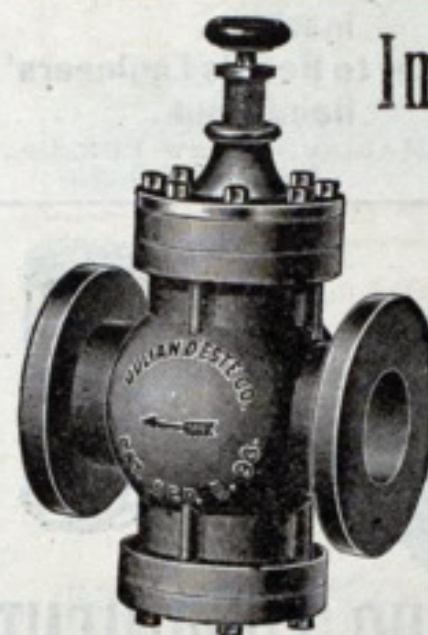
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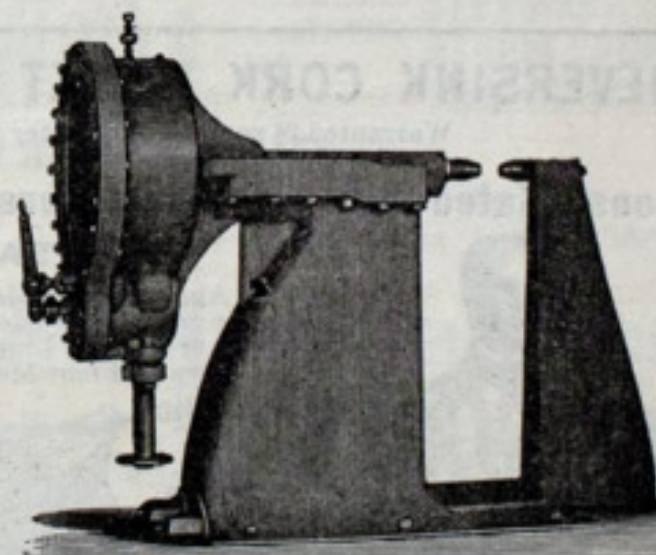
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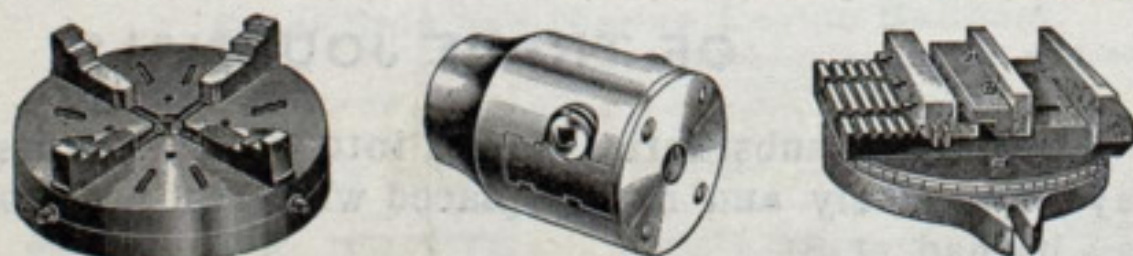


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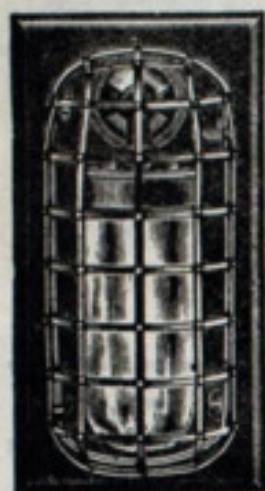
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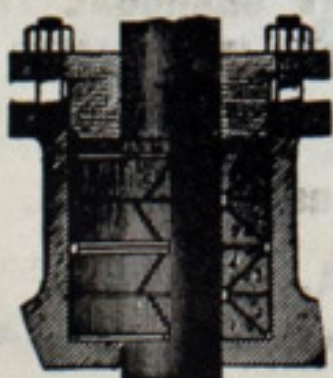
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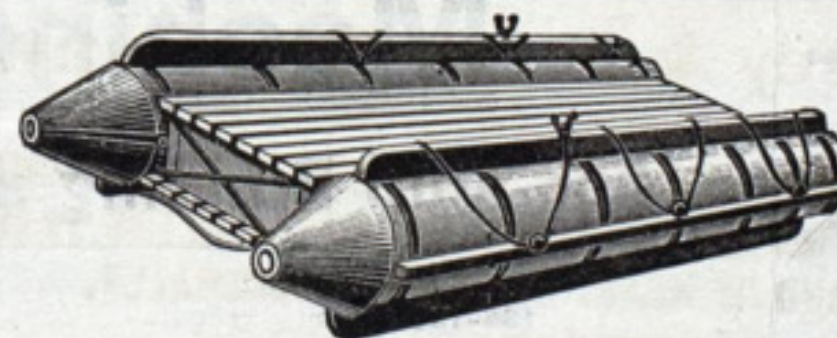
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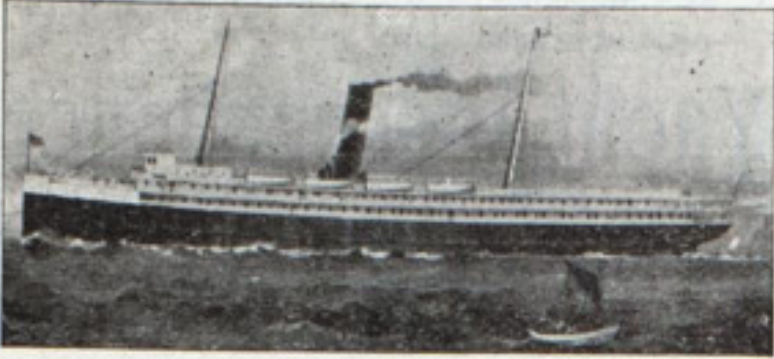
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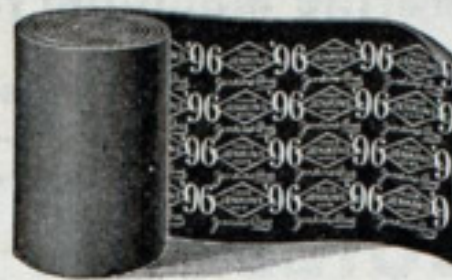
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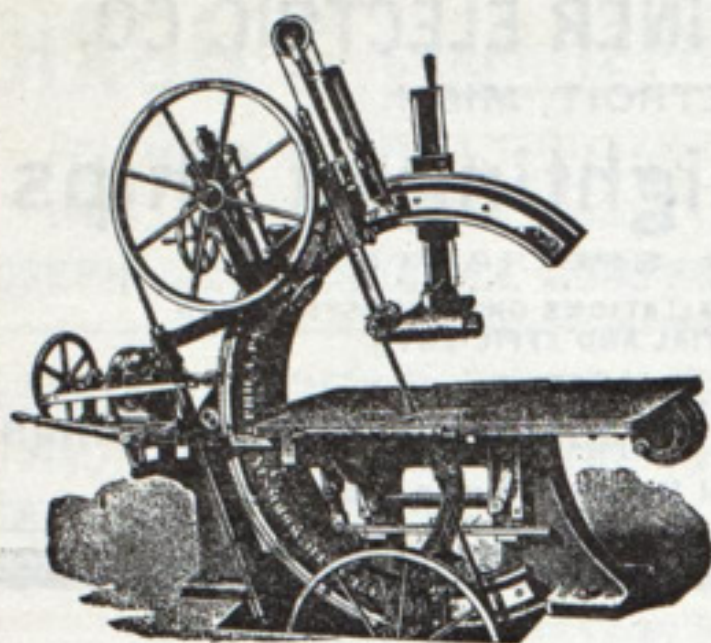
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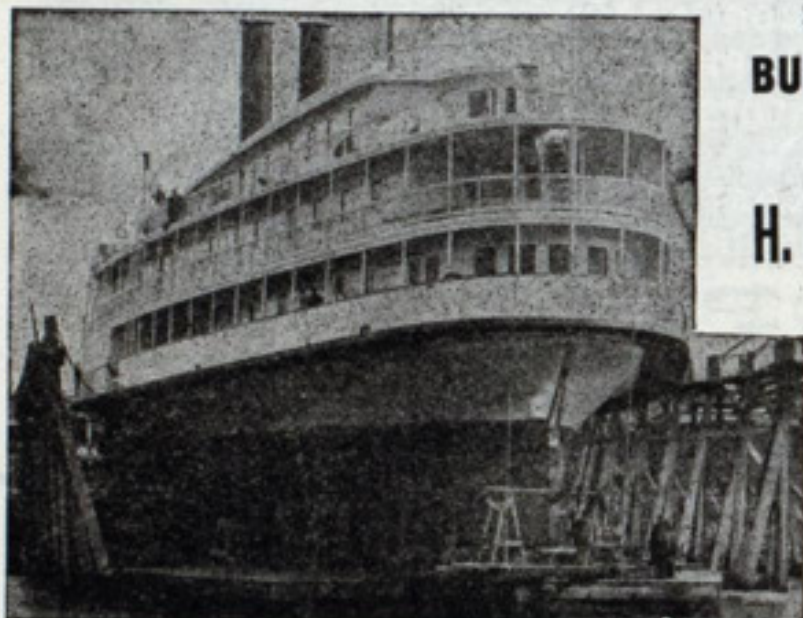
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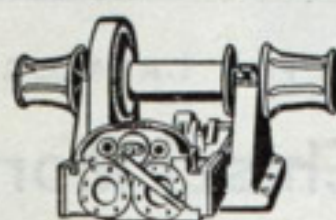
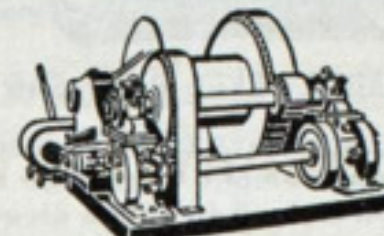
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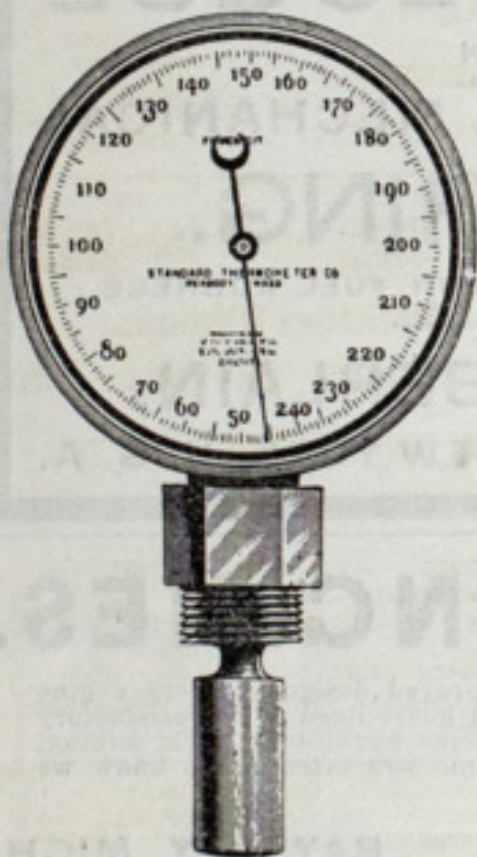
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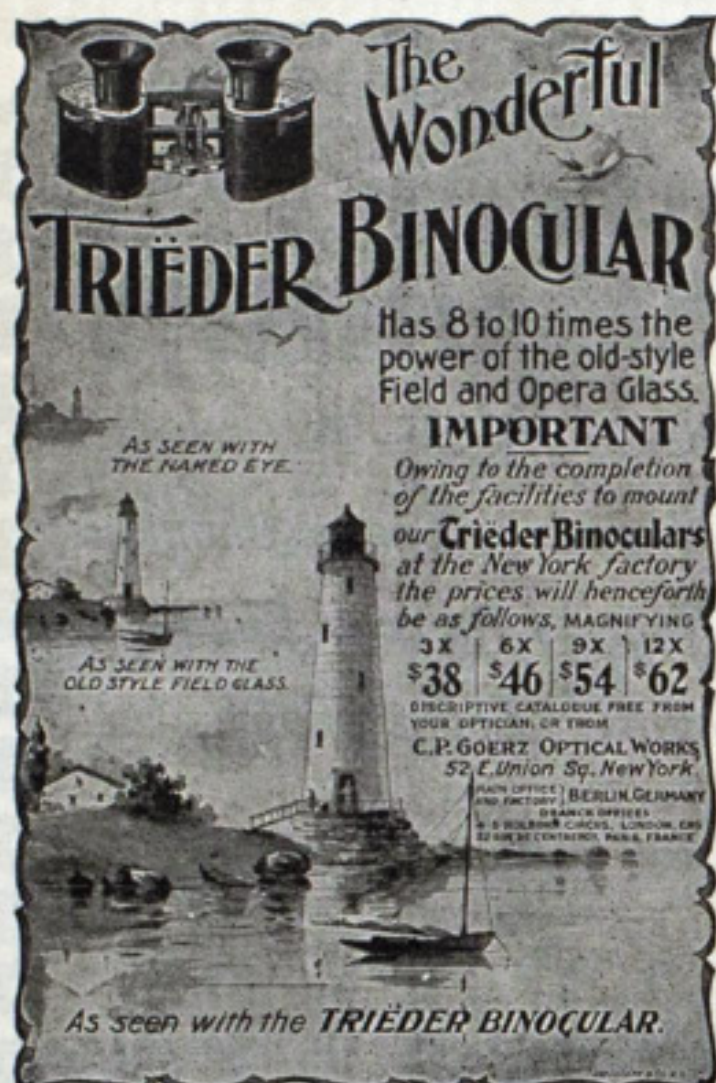
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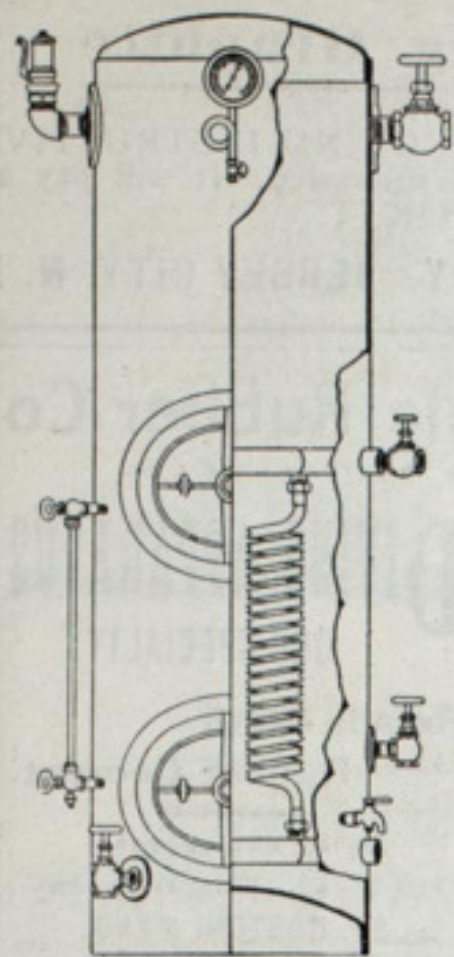
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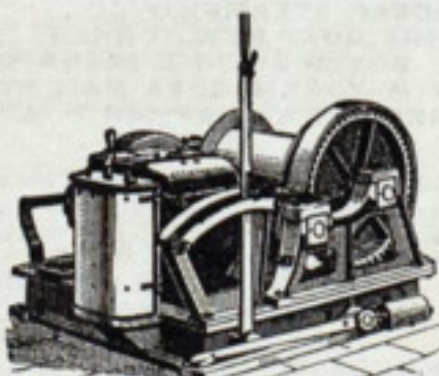
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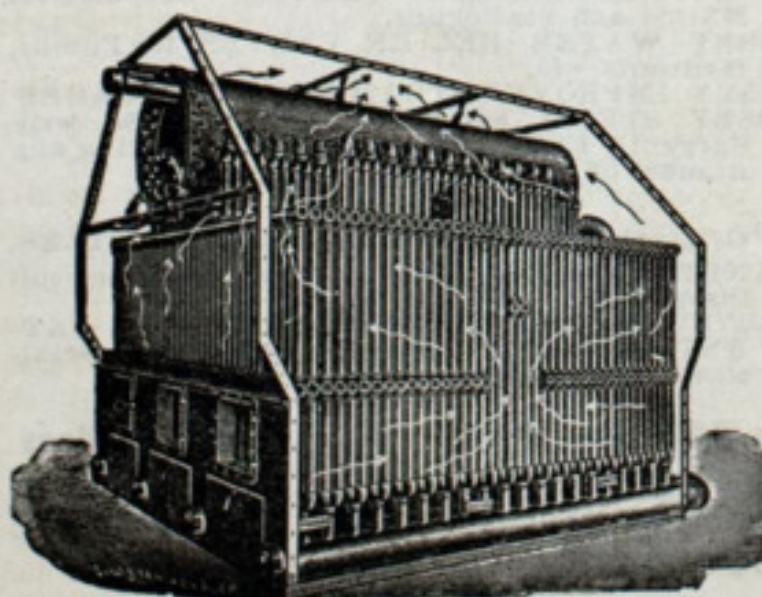
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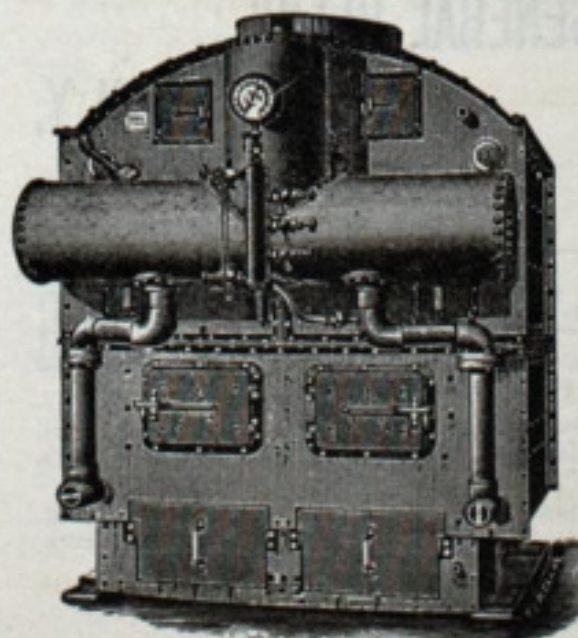
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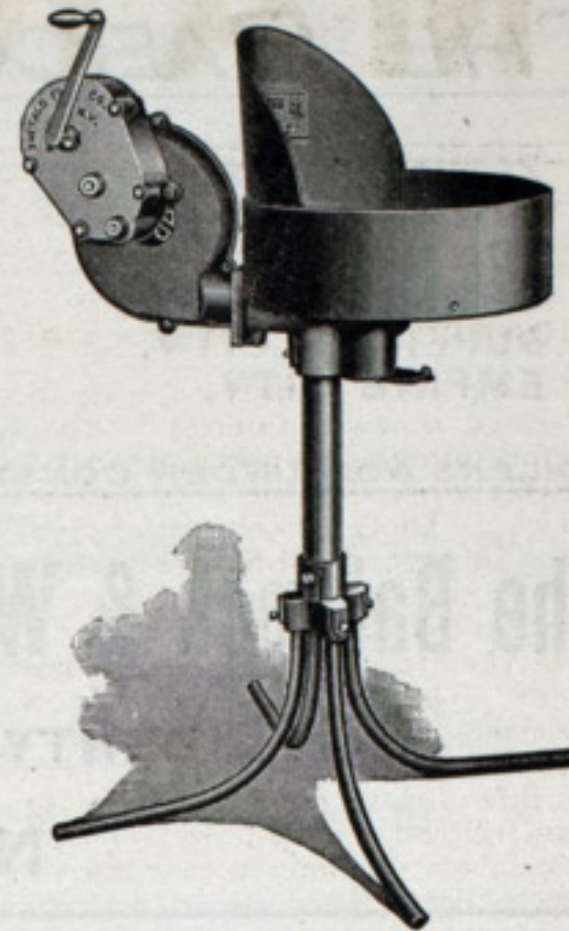
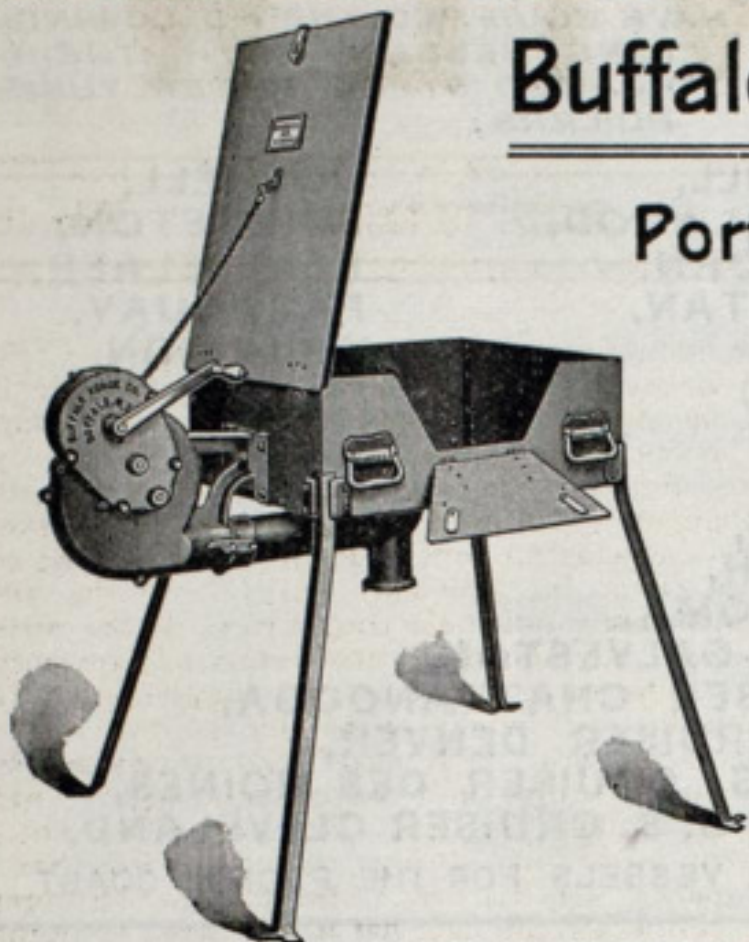
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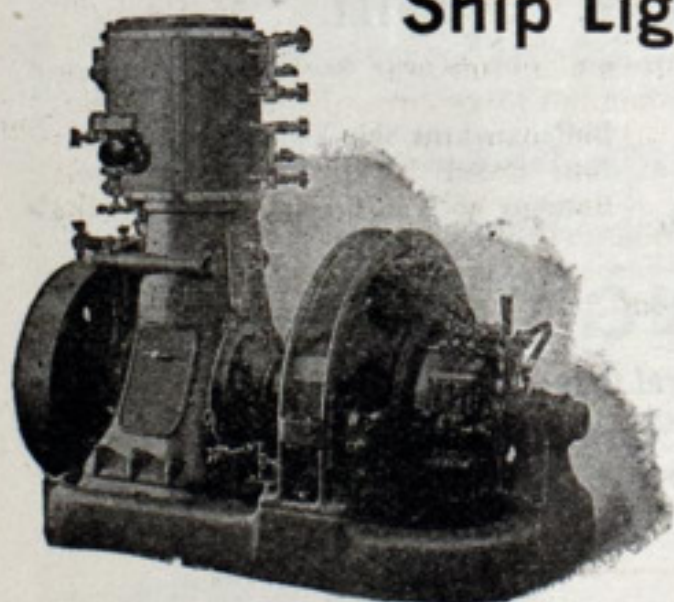
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